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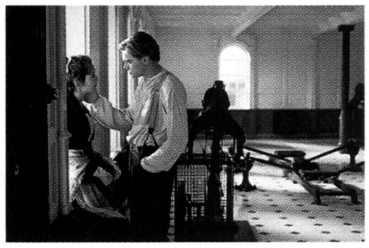
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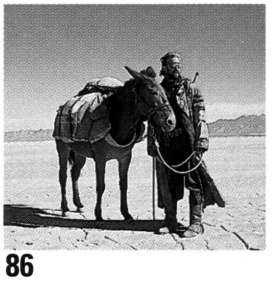
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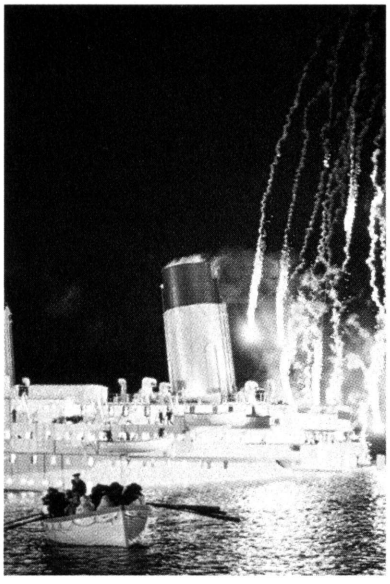
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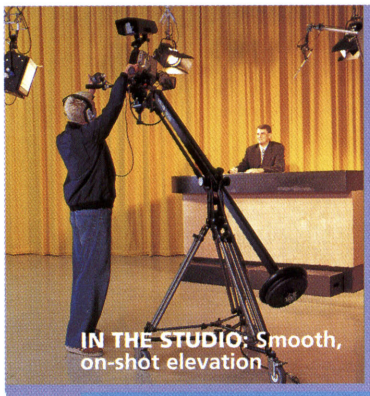
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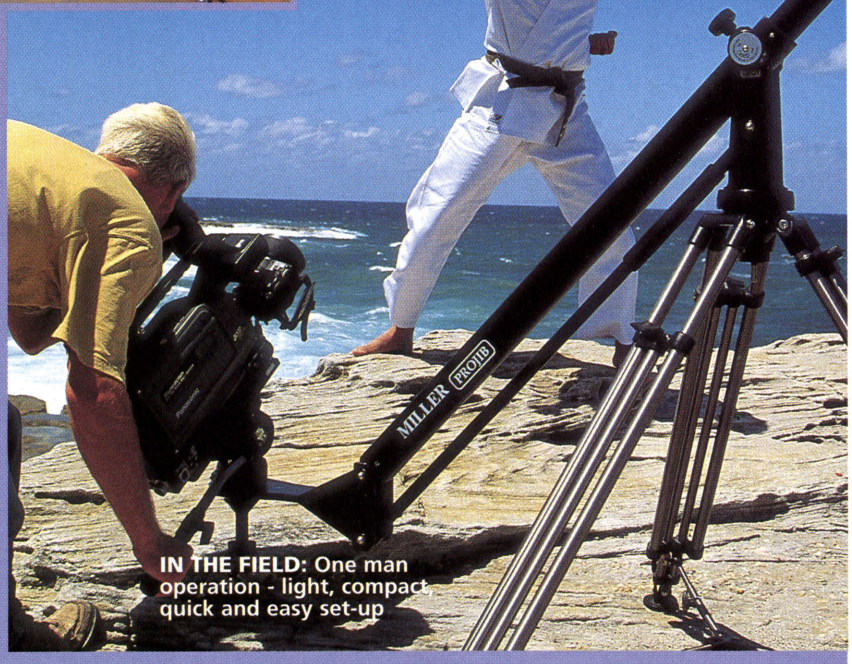
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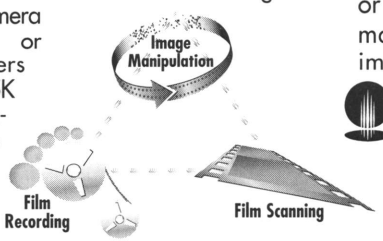
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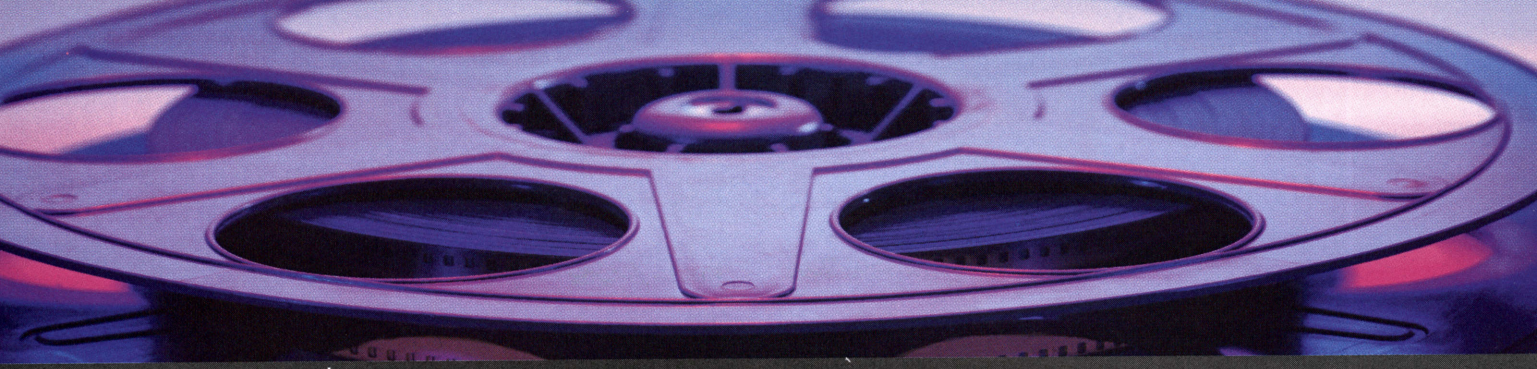
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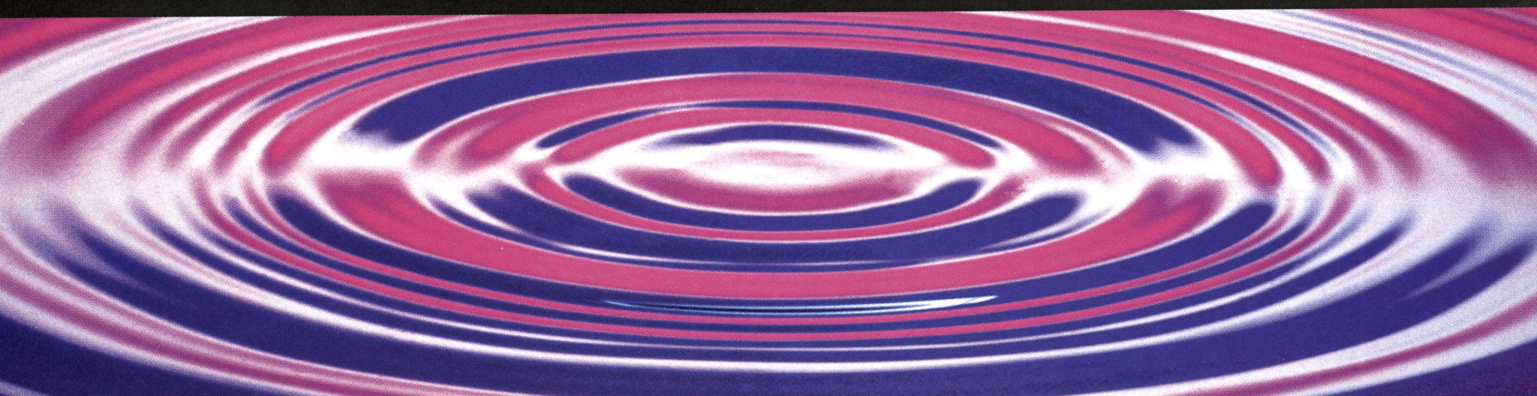
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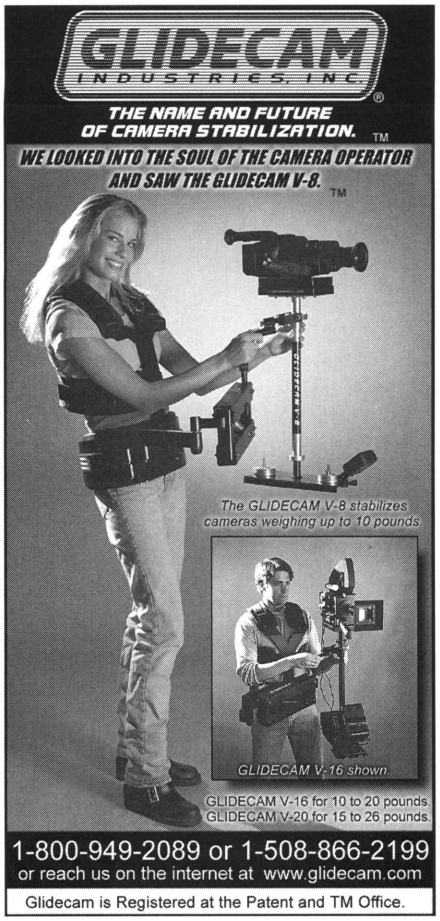
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Letters

Kudos for Kempster Coverage

Thank you for addressing production designer Victor Kempster's process in his collaboration with cinematographer Robert Richardson and director Oliver Stone on *U-Turn* [*AC* Oct. '97]. The collaboration between the designer, cinematographer and director is seldom addressed in any *other* publication, and as a subscriber, I enjoy the times that *AC* does this.

Film stocks, lighting systems and camera hardware are important to the way the environments the art department creates are photographed, and in order to provide "options against limitations," an understanding of technical developments and opinions is crucial. I enjoy the collaborative process with the cinematographer during a project, and reading *AC* helps me to be an informed supporter.

I expect that many production designers read *AC* in order to become better collaborators with directors and cinematographers. As with a cinematographer reading how another cinematographer may have solved a problem, so it goes for us production designers. Thank you for giving us that opportunity; I look forward to more such "sidebars" telling of other designers' experiences and lessons learned.

— Bradley M. Thordarson
Production Designer
Los Angeles, CA

Anamorphic Analysis

I've noticed that several recent articles have contained comments by cinematographers concerning the difficulties of shooting in anamorphic; in many instances, use of this format was in the planning stages, but Super 35 was chosen instead.

I'm always a bit puzzled by these comments. I shot my short film, *The Cargo Hold,* using Panavision anamorphic, and encountered no problems at all. Much of the film was shot with a 50-500mm zoom in a 20' x 14' cargo-hold set — I wanted to be close to the main character and still see his surroundings. We also shot inside a real 727 aircraft. [Whether we were] outside or within these close quarters, we had no problems with depth of field, distortion, sharpness, weight, etcetera. Lens speed also was not a problem when we were shooting night exteriors at Sea-Tac airport, using only a small lighting package.

I think it's a great format and any disadvantages are often overstated.

— Dean Durmisevich
Carnation, WA

Revising Wrap Shot

I'm writing in reaction to the October issue's "Wrap Shot" [*The Stranger on the Third Floor*, shot by Nicholas Musuraca, ASC]. One of my favorite films of all time — *Dead End* (1937) — is definitely a film noir; the photography by Gregg Toland [ASC] in the final part of the picture, with its shadows, is of an extraordinary quality.

Also, since not everything originates in the U.S., the influence of German expressionism [upon film noir] should also be mentioned.

— Rob Crawfurd
The Netherlands

[Ed. note: Gregg Toland's stellar work on Dead End *earned him an Academy Award nomination for Best Cinematography. Produced by Samuel Goldwyn with Merritt Hulburd, the film also earned three other nominations: for Best Picture, Best Supporting Actress (Claire Trevor) and Best Art Direction (Richard Day).]*

Kudos/Calls for Commercial Coverage

I would like to see more in *AC* about commercials — it would certainly prove very educational, especially for those like myself who predominantly do such work. Even though I consider *AC* the best magazine in its field, I hope this suggestion might help; being 29

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years old, I still have a lot to learn, but your publication is definitely helping the process — every subject you document, I always study in depth. Keep up the good work!

— Stefano Moro
Address Withheld

[Ed. note: AC certainly recognizes the importance of commercial projects to working cinematographers, and we devote our On the Spot column to this topic each month. This coming August, however, the magazine will offer even more information on the subject in a special theme issue focusing on commercials and music videos.]

Corman Climbs *The Tower*

Regarding the historical article on *The Tower of London* [*AC* Oct. '97]: Roger Corman unofficially "remade" this film, under the same title, for producer Edward Small in 1962. The script by Leo V. Gordon (yes, the actor), F. Amos Powell and James B. Gordon had the same Shakespearean source, with Vincent Price elevated from Clarence to Crookback. (Price would do a scene from *Richard III* in 1973's *Theatre of Blood*). Corman made the 79-minute film in 15 days using the crew from his Poe films, including cinematographer Floyd Crosby, ASC and production designer Daniel Haller; Francis Ford Coppola was dialogue director. For the climactic battle, stock shots from the 1939 film were used for long shots and intercut with close-ups made on a soundstage.

Producer Small was supplying the "B" films to fill out United Artists' release slate in the early Sixties, and was hoping to capitalize on the success of Corman's Edgar Allen Poe films. Corman feels that his version of *Tower* failed because Small insisted on shooting it in black-and-white, whereas the Poe movies had been done in color. Small's later copycat attempts — *Diary of a Madman, Beauty and the Beast* and *Twice-Told Tales* — were filmed in color by Ellis Carter, ASC and originally released with IB Technicolor prints.

— Rick Mitchell
Film Historian
Los Angeles, CA

1998 Chicago Alternative Film Fest

The Chicago Alt.film Fest will hold its first annual event from June 12 -14 at the Harold Washington Library Center, on 400 South State Street in Chicago. Emphasis will be on narrative feature films 60 minutes or longer. Entry forms are available by sending a SASE to Chicago Alt.film Fest, 3430 N. Lake Shore Drive, Suite19N, Chicago IL 60657 or through the website at [http://members.aol.com/ChiAtl. FilmFest]. All entries must have been completed after January 1, 1996. Entry fee for early submissions deadline of January 16 is $40; entry fee for the late submissions deadline of April 17 is $50. Films should be submitted on ½" VHS preview cassettes with press kits including plot synopsis, credits and photos. Entries will not be returned unless the proper return postage and return mailer are enclosed with the submission.

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This fall's Congressional hearings on high-definition television were so riveting they might have made a perfect debut drama for the new medium itself. Accused by senior members of Congress of backtracking from their commitment to bring HDTV to America's living rooms, the broadcasters squirmed, grimaced, pontificated and finally did a complete about-face.

Preston Padden, president of the ABC Television Network, reversed statements he made in August in which he said his network was likely to abandon HDTV in favor of a multichannel DTV approach. "ABC remains committed to broadcasting some HDTV programming," Padden testified before the Senate Commerce Committee. "We are committed to giving HDTV a fair market test." He also said ABC has no plans to transmit subscription programming over the DTV spectrum.

In regard to free, over-the-air multiple-channel broadcasting, Padden said, "We have not yet come up with a plan to make it work." ABC can't tell Congress all the details of its DTV strategy because it does not have one yet, he informed the senators. "I don't know any broadcaster who can. There are simply too many unknowns."

Similar promises to give HDTV a chance came from CBS, NBC and Sinclair Broadcast Group, an owner of 29 television stations that had earlier backed away from airing high-definition programming. The National Association of Broadcasters (NAB) renewed its commitment to HDTV and sent Robert Decherd, chairman of A.H. Belo Corp., a Dallas-based owner of 16 network-affiliated stations, to testify on behalf of NAB members. Decherd termed "blue sky" any plans to use DTV spectrum to transmit multiple channels of standard definition programming rather than a single channel of HDTV.

Despite their new assurances, it was clear that the broadcasters had little credibility left on Capitol Hill. Leading members of Congress from both sides of the aisle, as well as a top White House telecommunications official, were open in their skepticism of the broadcasters' latest statements. Several maintained they had been outright deceived by the broadcasters during the negotiations for digital TV spectrum.

Broadcasters on the Barbie

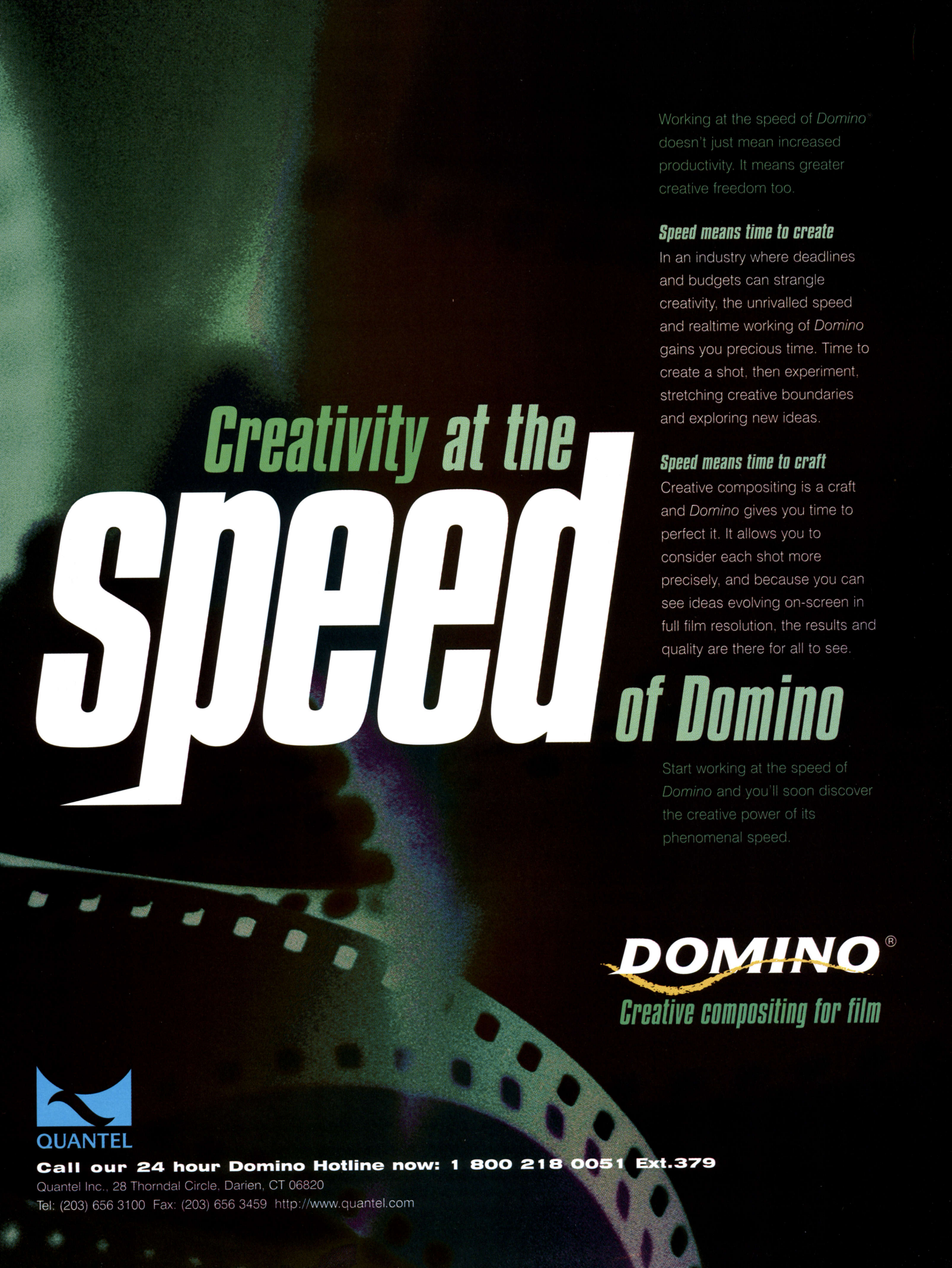
by Frank Beacham

The Congressmen repeatedly referred to a quote in the *Wall Street Journal* on Sept. 12 by Michael Jordan, chairman of CBS parent Westinghouse: "This whole digital transition has been left to the engineers until just about six months ago. All of a sudden we got this thing approved, and nobody has a clue what they are going to do."

Sen. John McCain (R-AZ), chairman of the Commerce Committee, opened the HDTV hearings by citing Jordan's comment. "To suggest, as Mr. Jordan does, that this unprecedented effort to make digital TV a reality was some sort of skunkworks engineering project that caught the business guys by surprise is hard to accept — especially when, in a keynote speech just three months ago to the International TV Symposium in Montreux, Mr. Jordan stated that 'HDTV will drive the transition because it's the only really superior product for consumers.'"

Sen. Ernest Hollings (D-SC), a former Commerce Committee chairman closely involved with DTV issues over the past decade, was outraged by Jordan's statement, and quoted testimony from previous Congressional hearings by broadcasters who called HDTV essential to the long-term survival of the broadcast networks. The entire broadcast industry, Hollings said, wanted HDTV, not just digital television. "It was about sharp pictures," he emphasized. "If you are trying to change the rules and get a whole new policy, you'd better get yourself a new Congress."

Larry Irving, assistant secre-



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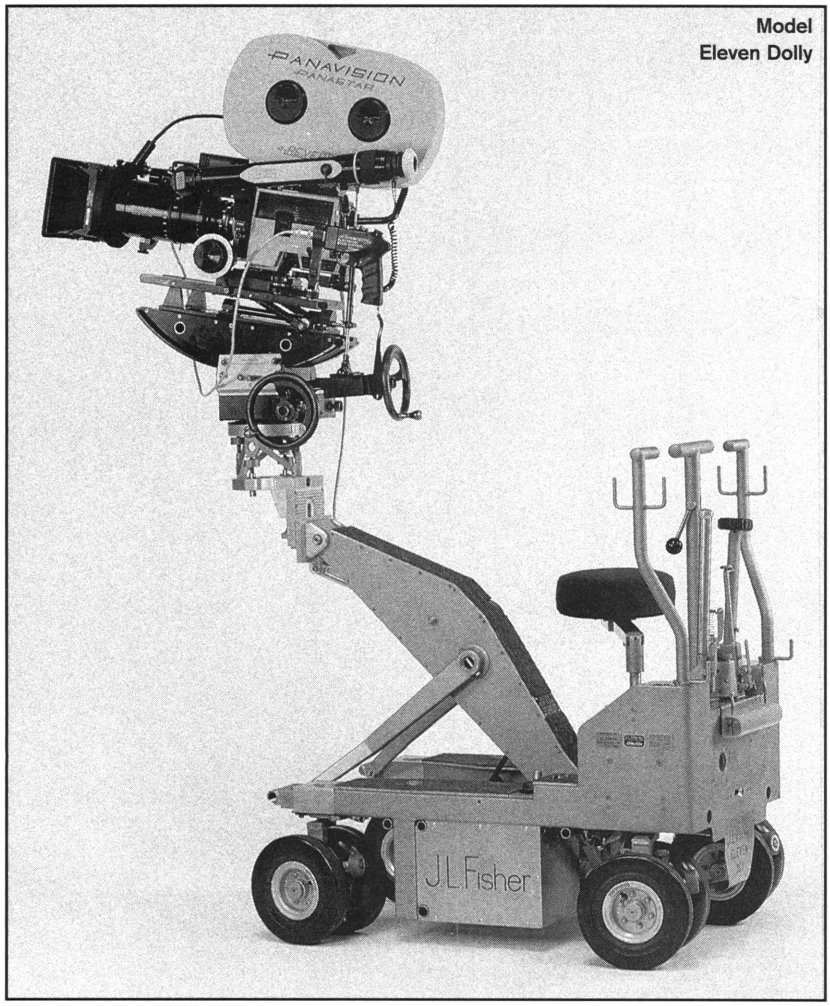
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tary for communications and information at the Commerce Dept., said that for the past 12 years the broadcasters have presented a clear plan for digital broadcasting. Only in recent weeks has that changed, he noted. "Up until the Balanced Budget Act [passed on Aug. 5], we never heard one thing about multicasting or subscription services," Irving said. "By the middle of August, they are talking about [these services]. I don't think that was a coincidence. I think until Congress finally determined they would get their broadcast spectrum free and in virtual perpetuity, the broadcasters kept very quiet about it."

Rep. Billy Tauzin (R-LA), chairman of the House Telecommunications Subcommittee, gave the broadcasters a blunt choice: either broadcast HDTV full time or return the digital spectrum to the American people. If they choose to multicast, Tauzin said, the broadcasters should pay new fees or incur significant public service obligations in exchange for the spectrum. "There must be a quid pro quo," he stated. "As broadcasters begin making their build-out plans, they are calculating the costs of new TV towers, cameras, editing equipment and so forth. But have they figured into their costs what they owe the American people? I don't think so."

Sen. Ted Stevens (R-AK) suggested that because the FCC failed to establish a clear standard for digital television, we're headed for "the Betamax problem all over again... only in spades."

Addressing the broadcasters' contention that consumers will ultimately decide whether or not HDTV will be successful, Sen. Jay Rockefeller (D-WV) expressed skepticism. "You say, 'We will do whatever the people want,'" Rockefeller told broadcasters. "I've always been very suspicious of that. I think you all do what you want and the people have to follow along."

McCain said the plans outlined at the hearing to create limited HDTV programming are not going to solve the "chicken and egg" problem of which comes first: affordable HDTV sets or abundant HD programming. "If people don't get much HD programming, then they are not going to buy the sets," McCain said. "Manufacturers won't make the equipment if they are not sure consumers will demand [the programming]. There's a real conundrum here."◆


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Production Slate

compiled by Andrew O. Thompson

Envisioning Life in *The Sweet Hereafter*
by Mark Dillon

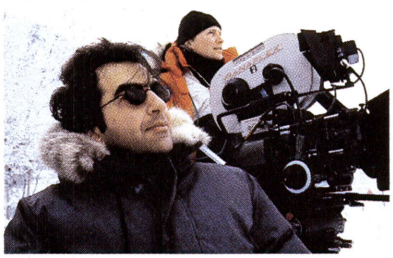
While frequently crosscutting between timeframes, Canadian writer/director Atom Egoyan's *The Sweet Hereafter* recounts a school bus accident that claims the lives of 14 children, and examines the effect that this tragedy has on a small British Columbia town. The appearance of metropolitan lawyer Mitchell Stephens (Ian Holm) adds to this drama as he tries to convince the bereaved parents that someone — perhaps the bus' manufacturer — is responsible for the mishap, and that a large cash settlement could be within their grasp. Stephens' star witness is Nicole Burnell (Sarah Polley), a teenage crash survivor whose injuries leave her confined to a wheelchair. Nicole's level of cooperation, however, becomes confused due a dark relationship with her father, Sam (Tom McCamus).

This adaptation of the Russell Banks' novel of the same name, was the most-awarded entry at the 1997 Cannes Film Festival, capturing Le Grand Prix, The International Film Critics Prize, and The Ecumenical Jury Prize. *The Sweet Hereafter* also opened the recent Toronto International Film Festival, where Egoyan's picture earned the Toronto-City Award for Best Feature Film, an honor it shared with Thom Fitzgerald's *The Hanging Garden*.

University of Toronto alumni Egoyan first met cinematographer Paul Sarossy, CSC in 1984 while being interviewed about his first feature, *Next of Kin*, on a TV show produced by Sarossy's father, himself a former newsreel cameraman. Sarossy, then a film student at Toronto's York University, was assigned to drive Egoyan home in a raging blizzard. Years later, the Egyptian-born Egoyan approached Sarossy to shoot his 1989 film *Speaking Parts*, which brought the cameraman a CSC nomination. The duo furthered their collaboration on *The Adjuster* (1991) and *Exotica* (1994), with the latter earning Sarossy a CSC Award. The Canadian cinematographer's domestic credits include Srinivas Krishna's *Masala*, Denys Arcand's *Love and Human Remains*, and Patricia Rozema's *White Room*, as well as such American films as *Affliction* by Paul Schrader, *Picture Perfect* by Glenn Gordon Caron, and *Mariette in Ecstasy*, directed by John Bailey, ASC. In 1996, Sarossy received an ASC Award nomination for Norman Jewison's "Soir Bleu" segment of the anthology *Picture Windows* (see *AC*, May '96).

Sarossy finds Egoyan's enthusiasm for experimentation to be the greatest advantage in working with the director, noting, "He creates a stress-free environment where everyone involved has the freedom to be completely exploratory creatively. It's that rare film set where you can say 'Well, what can we try today?'"





Above: ***The teenager Nicole Burnell (Sarah Polley) reads a bedtime tale to a pair of schoolchildren fated for a watery grave. All interiors were shot in a Toronto studio and featured muted lighting effected mainly with multiple sources.*** **Left:** ***Director Atom Egoyan and cinematographer Paul Sarossy, CSC (behind Panaflex GII camera) on location in Merritt, B.C. while filming*** **The Sweet Hereafter.**

The pair's on-set relationship leaves Egoyan to compose the shots while the cinematographer has free rein over all lighting issues. Such a setup is fine by Sarossy since his cinematographic heroes are highly regarded for their exemplary lighting. "I particularly love the work in [Polish director Krzysztof] Kieslowski's *Three Colors* trilogy — that of Slawomir Idziak [*Blue*] and Piotr Sobocinski [*Red*]. Cinematography is often technically amazing, but that work really verges on art."

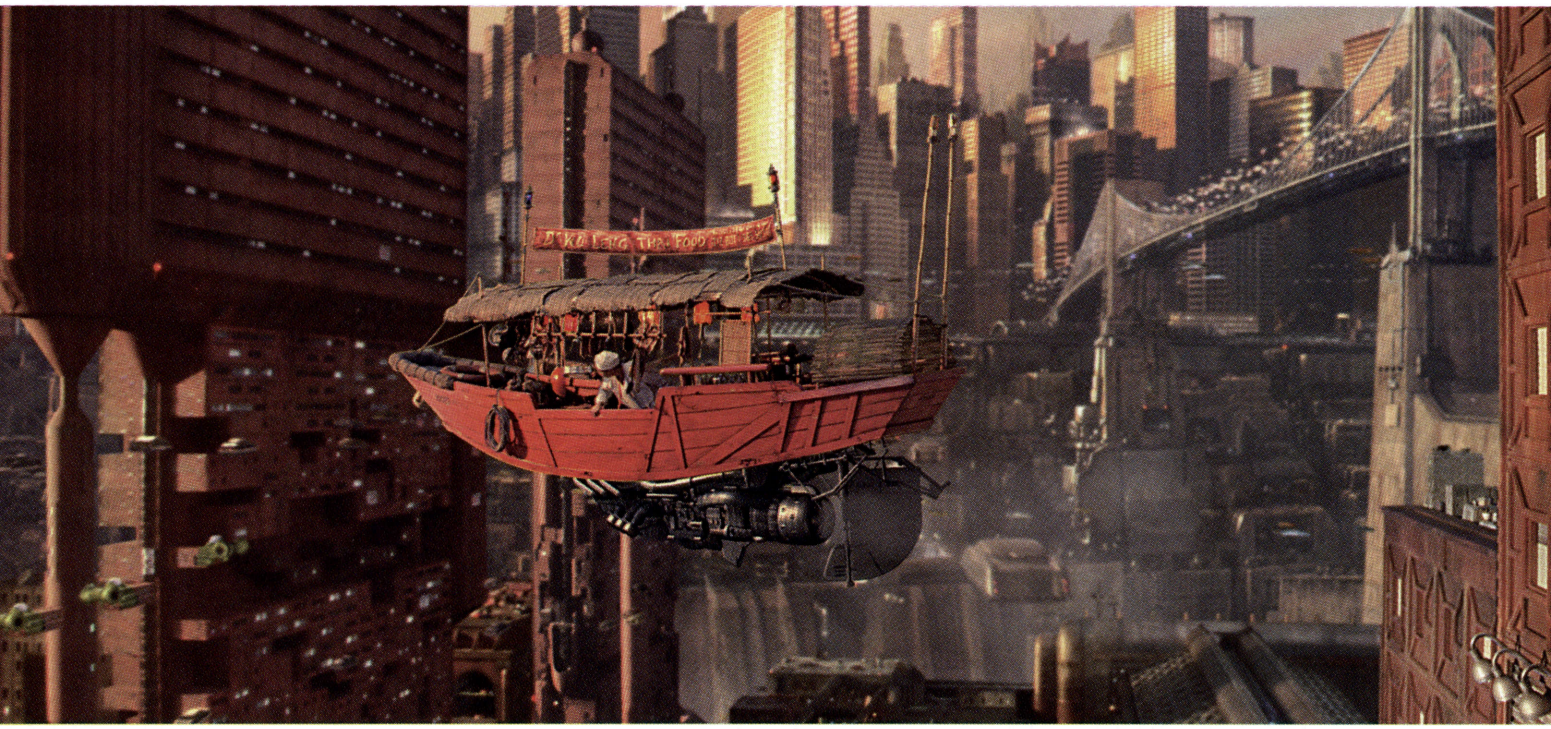
Early on, Egoyan decided that *The Sweet Hereafter* would be best visualized in an anamorphic 2.35:1 frame. While the widescreen format is often used to showcase spectacular vistas in the film — such as the mountain ranges captured on location in Merritt, B.C. — Egoyan also found it superior for the studio-bound interiors shot in Toronto. The director explains, "I'm attracted to how intimate the anamorphic frame can be — how you can frame two people speaking with a comfortable and natural distance between them, and yet be so close on their faces. It creates a very dynamic composition where you're able to 'be there' and not force it."

In keeping with the anguished parents' grave mood, such two-shots are dimly lit, and Egoyan typically cuts from

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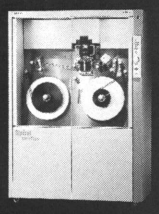
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"For plate photography we used Arriflex 535B cameras and a prototype of the new 435 high-speed camera. About halfway through production Arriflex replaced our prototype with one of their first production 435 cameras. Visual effects DP, Bill Neil and I were both surprised by the steadiness of both cameras at all speeds. In fact, the new 435 was rock steady, good enough for composite work from 1 fps to 150 fps, both forward and reverse. It instantly became our camera of preference throughout the production. Fantastic!"

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them to expansive, bright snowy landscapes. "I wanted that to be a shock, the way light can surprise and give revelation," the director notes. This use of contrast becomes a visual motif, providing a sense of hope in the otherwise bleak tale.

Per Egoyan's directive that *The Sweet Hereafter* have the sense of a "dark fairy tale," Sarossy's imagery is imbued with an otherworldly quality — a scheme partially attained through the use of naturalistic lighting. One of the film's key sequences, a frequently returned to flashback depicting the fateful bus crash, was photographed in bright daylight during five days of exterior work. A series of events ends in horror as the bus runs off the road into a frozen lake and plummets through the ice (accomplished with CGI from Toronto effects houses TOPIX and Mad Dog Digital).

The locale's surrounding snowscapes amplified the desired sense of purity, but also posed timing problems which Sarossy had to later solve in the lab. "Shooting in snow really reveals any day-to-day inconsistencies in the processing," the cinematographer explains. "You see it in the whites. One day they might be a little pink, and the next day a little green. Our timer [Chris Hinton from Deluxe in Toronto] had to even that out. Also, our helicopter shots were done on a very sunny day, yet our crash scene was shot on an overcast day, so he had to massage that a bit to make the discrepancy less apparent."

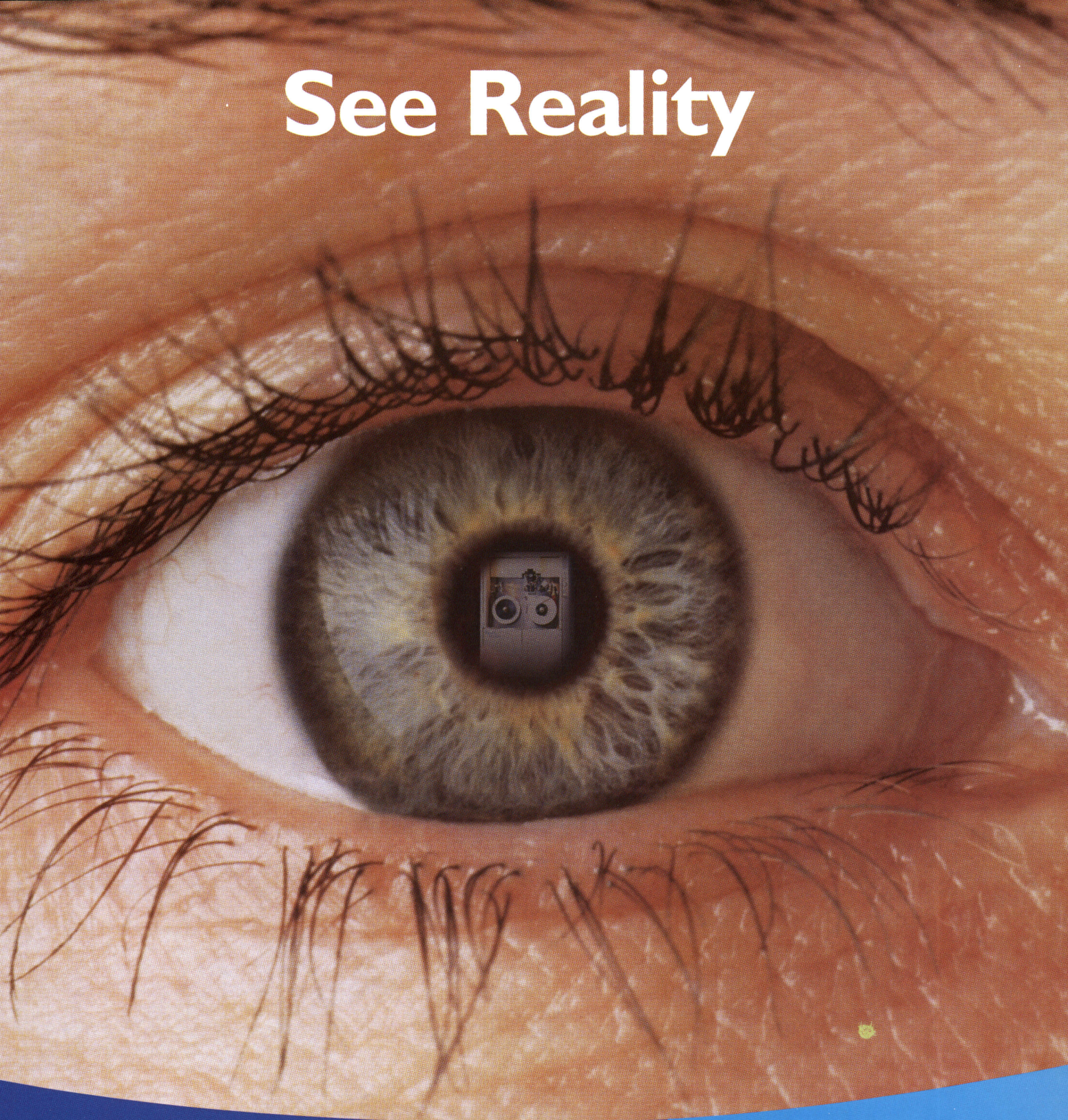
Sarossy explains that his lighting approach frequently entailed the mixing of color temperatures. For daylight shooting, he often mixed in illumination from tungsten-balanced Maxi-Brutes. He elaborates, "In dusk scenes we would occasionally use an 81EF filter on the lens, which half-corrects for daylight. So as you're playing down the middle, the tungsten sources are slightly warm, and the daylight is slightly blue, which is an interesting mixture."

The cameraman notes that the twilight shots, photographed at the end of five consecutive days, proved tricky to pull off with the older Panavision E-series anamorphic lenses. "You are obliged to work at a certain T-stop — usually T4 — for them to perform well," he says. "With the daylight diminishing with every passing minute, you have to catch it just at the perfect moment. And you can't really go any more open with the lens or the performance gets very poor and focus becomes problematic." This necessitated using Kodak Vision 500T 5279 for all interiors and night exteriors, while 100 ASA EXR 5248 was employed for the day exteriors.

Sarossy sometimes departed from classical lighting methods by recalling inspiring illuminations he'd seen during sleepless summer nights spent in New York City. "I remember lying awake in my room being absolutely fascinated by the window shapes projected on the wall by passing headlights. One of the streets lights was white, and another was orange, and there was also a yellow one — I began to realize that there are so many confused light sources. As a cinematographer, you learn the cardinal rule that the most elegant way to light a scene is with a single source, yet in real life — even in the daytime — this rarely occurs. I began to wonder why there is this tremendous fascination with the traditional style."

Exemplifying this multiple-source strategy — and Sarossy's fondness for practicals — is an extramarital rendezvous between Billy Ansell (Bruce Greenwood) and Risa Walker (Alberta Watson) at the Bide-A-While motel. Billy waits for her in a darkened room, illuminated almost solely by the small lamps on the wall. The glow from the motel sign outside penetrates through the green curtains, forming a colorful pattern on the inside walls. Risa enters wearing a winter coat, and removes it almost immediately. The headlights from a passing car suddenly stream through the window and illuminate Risa's body, revealing her to be clad only in undergarments.

For all their careful preparation during *The Sweet Hereafter*'s production, the filmmakers were very much at the mercy of the harsh Canadian elements while working in Merritt. "If we had shot there a week later," Egoyan recalls, "we would have been completely closed down by the most massive snowstorms B.C. has ever experienced — the whole province was paralyzed." But the director attests that he and Sarossy have so far scored an impeccable track record with Mother Nature, explaining one more reason for the pair's lasting partnership. Adds Egoyan with a laugh, "We stick together for luck!" ➢



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Right: ***Actress Emma Thompson stands her ground before the North Sea in*** **The Winter Guest.** ***Center: The same shot, but with a sea digitally frozen by Quantel's Domino.*** **Below:** ***British actor-director Alan Rickman (right) and Irish cameraman Seamus McGarvey prep a set-up from the shore of Scotland's Coast of Fife.***

Adding Chills to *The Winter Guest*

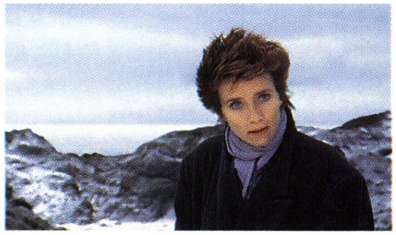
by Jean Oppenheimer

An intimate, character-driven story about the residents of a small Scottish fishing village, *The Winter Guest* seems an unlikely candidate for high-end digital visual effects. But this introspective drama directed by British actor Alan Rickman contains more than 75 shots either enhanced or wholly created on the Quantel Domino.

"Here you have a film in which the narrative and the special effects are supporting each other, and not in the name of science-fiction or showing off," says Rickman, who makes his directorial debut with *The Winter Guest*. "The effects are meant to contribute to the mood and atmosphere and are designed to be invisible."

Sky replacement, 3-D seagulls and a frozen ocean are just some of the digital illusions created for the film by special effects supervisor Steve Rundell, effects producer Blondel Aidoo, effects artist Janice Tso and the Domino, a compositing system which allows the operator to composite at 3,000 lines resolution and play back in real time at that same high resolution.

The Winter Guest, which began life as a play (directed by Rickman in London a few years ago), takes place over a four-hour period on a day so frigid that the North Sea freezes over. In actuality, Rickman was reliant on Rundell and the Domino to concoct this climactic rarity. Rundell, who founded Hollywood-based visual effects house D·REZ, started this process by shooting water plates and building up a library of different textures. "When the characters were down on ground level we wanted the audience to feel that the ice just went on and on into the distance," Rundell explains. "We wanted to feel the thickness of it. For a higher shot on a cliff bluff, [the ice] would appear to be a little smoother because you were farther away."



One concern, of course, was how to shoot the actors in front of water which *wasn't* frozen. "First, I designed it so all of them would be backlit," explains Rundell. "That gave us plenty of separation between the actors and the ocean. It was very important not to have to have blue screens — as the norm would be — so the actors could really be in the environment and not on a sterile stage. Their clothing was always dark, but different enough from the gray background. So instead of having a blue screen, it was like having a gray screen. That way we were able to separate actors Emma Thompson and Phyllida Law, go behind them and freeze the ocean, then go back and freeze the shot."

The frosty landscape was critical to the film's atmosphere, serving as another character in the story. The villagers — who include two young boys, two teenagers, two elderly women, and Thompson and Law as a strong-willed woman and her equally implacable mother — unquestioningly accept the isolation and confinement imposed by their surroundings. In fact, they seem to have incorporated such desolation into their psychological and emotional makeup.

Rickman and Irish-born cinematographer Seamus McGarvey (*Butterfly Kiss*, *Slab Boys*) wanted to maintain a gray, overcast look throughout the film. "It had to do with the emotion in the script," points out McGarvey, who spent years working as a still photographer before turning to motion pictures. "We wanted this almost oppressive, frosty quality. When direct sunlight hits a beautiful little fishing village, it can look a bit picturesque. But when you have cloudy, overcast weather there is real drama in the skies."

Scottish winters are normally quite dismal, but last year the Coast of Fife, situated along the country's northeastern shore, became a veritable Costa del Sol. To soften the sunlight, McGarvey used an array of scrims, nets and silks to shield the actors during close-ups. "It was like a scene out of Terry Gilliam's *Time Bandits*," he recalls with a laugh. "We'd be shooting the most intimate of scenes while 10 electricians stood there with ropes wrapped around their arms, holding onto these huge things that were flapping madly in the wind."

Of course, McGarvey still had to deal with the problem of reflected sunlight. The bright blue sky meant that the shadows themselves took on a much bluer hue. He explains, "As a result of that we had to 'blue up' our key light and our bounce fill. Instead of reflecting back into the shaded area, we would reflect using a slightly bluish card. That kept the color temperatures even."

Daylight exteriors were shot on Kodak's EXR 5293 and McGarvey used an 81EF filter which, with its slightly reduced level of orange correction, gave the film a bluer, cooler quality. He also relied on various levels of Tiffen Black ProMist filters to soften and reduce contrast in the image.

For wide shots, the cameraman took advantage of whatever wispy clouds might momentarily obscure the sun, since waiting for the weather to turn was clearly impossible. Meanwhile, Rundell, who also served as second-unit director/cameraman, shot whatever dark or dramatic clouds appeared for use as sky plates. "On those days when we couldn't avoid shooting against a blue sky, I could later totally use the Domino

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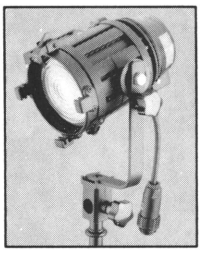
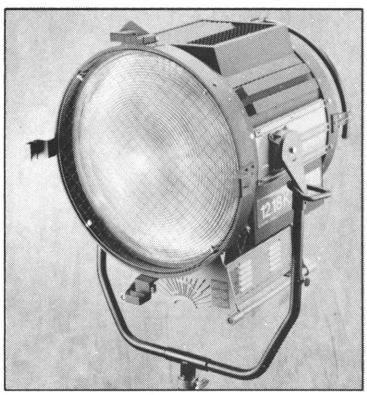
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to replace the blue with a gray cloud background. On a partly sunny day we could just go in, isolate the blue, take the color out of it and make it gray."

Rundell used the Domino to cut and paste together a flock of seagulls for the film's opening shot. "To choreograph real seagulls to do what we wanted them to do at a 1,000' altitude would have been tough," he jokes. "Therefore, I shot real birds, knowing I would need them in a certain flying mode [for other shots]. Say a seagull would fly by on take one, but take three was the editor's choice for performance. We would pull the seagull off take one and put it into take three."

The digital effects work also provided a unique method for tackling unforeseen problems. Most of *The Winter Guest*'s beach scenes were shot on a national reserve, which could not be blocked off from the public. In the middle of one emotional sequence — in which Thompson's character is crying and stomping around in the sand — two tourists casually strolled across the crest of a hill and right into frame. "Rickman was ready to yell 'Cut,' but I said 'Keep rolling,'" recalls Rundell. "Emma was nailing it perfectly. We just painted the people out."

Other cosmetic effects included muting the color of a pint of lager beer, erasing a little boy from the background of another scene, and adding snow to window sills and along the shore. Snow fell for only one day during the shoot, providing much-needed ground cover for the opening wide shot of Law trudging across an open field. British company Snow Business supplied the faux flakes when digital effects weren't enough. "There was one shot where Emma and Phyllida walk near the lighthouse," says Rundell. "There was no way anyone could blow snow all over the hillside, so I had them just patch where the women were walking, to get those real nice footsteps, and we did the rest digitally."

By the film's finale, every character has experienced something of an epiphany. According to McGarvey, Rickman insisted that the conclusion have a hopeful quality: the last shot is of the two young boys walking out onto the frozen ocean, disappearing into the mist. "We shot several takes and suddenly the sun came out," remembers McGarvey. "Because of the mist, it wasn't coming through, but there was a flickering hint of light kicking off the ice. It was one of those magical moments because you take it as a sign of hope. It was perfect for the feeling of the film."

A Strung-Out *Mouse Hunt*
by Andrew O. Thompson

During a visit to downtown L.A.'s abandoned Bingo Building in early April, the scene inside seems to have sprung straight from the pages of a Charles Dickens novel. Hues of rust and earthtone reign supreme in this brick-walled edifice, where elderly men and women clad in soot-soiled wool and tweed outfits toil amongst gargantuan metallic contraptions and an assortment of barrels, crates and boxes overflowing with a flaxen substance. All of this commotion is business-as-usual at the Smuntz String Factory, except that owners Lars and Ernie Smuntz (played by Lee Evans and Nathan Lane) are executing a shady deal with a pair of suited mystery men in fedoras: their hope is to rid themselves of a pesky mouse which threatens to ruin the brothers' thriving business, and pull them both into a whirlpool of chaos.

From an overhead catwalk, Greek-born cameraman Phedon Papamichael (*Unstrung Heroes, Unhook the Stars, Phenomenon*) surveys this scene as he ascertains a proper ambiance for this space, which happens to be a key set for the DreamWorks farce *Mouse Hunt*. This man-versus-mouse comedy marks the feature debut of Gore Verbinski, the acclaimed commercial director behind such Clio-winning work as the initial Budweiser "Frogs" spot and Nike's "100-Foot Hoop" advertisement featuring basketball star Michael Jordan.

Though *Mouse Hunt* 's time period is somewhat undefined, Linda DeScenna's production designs for the Gothic-styled mill draws inspiration from such eras as the Britain's Industrial Revolution and the American Depression. To highlight the factory's rather drab aesthetic, the cinematographer opted for illumination from "big, soft sources — like a 20K aimed through muslin — which wrap around objects and give them some shape. The only color in this entire space comes from the slightly warm sources which match the sunbeams coming in.



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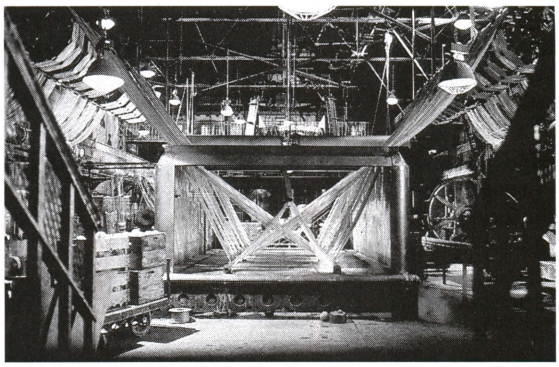
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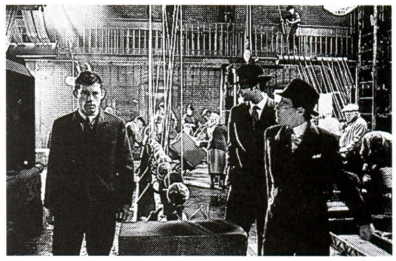


Left: ***The interior ambiance for*** **Mouse Hunt** ***'s Smuntz String Factory as shot in the Bingo Building, an abandoned L.A. brewery.*** **Below:** ***Lars Smuntz (Lee Evans) mulls over his dealings with a pair of fedora-topped scoundrels.***

During preproduction, Linda and I tested different backgrounds to determine how dark the sets could really be in connection with my lighting; darkened sets can better handle soft light, which in itself is difficult to cut."

But hard shafts do emanate from the top row of windows, which are backlit with 7K Xenons fitted with clear glass. This allowed Papamichael to "augment some beams to single out certain machinery to be singled out, highlight other objects and backlight the cords and strings." A soft, unidirectional ambiance comes from the lower panes of frosted glass, which have 18Ks blasting behind them. Hanging from the ceiling are multiple practical lamps loaded with 500-watt daylight bulbs. Underneath the string machine's "Cat's Cradle" lay several dimmer-controlled Deca lights, which are fitted with blue gels to match the space's otherwise neutral aura.

To further enhance the film's muted look, the filmmakers planned to apply Technicolor's ENR process, but only in the most minimal amount — approximately 40 percent. "I'm just going to use the ENR on the release prints just so that the blacks stay really rich; I'm not really looking to add a lot of contrast later," admits Papamichael. "Desaturation is already built in[to the film] through the monochrome-like set design and wardrobe. Our palette is very limited — there are no primary colors, and everything is on the rust or olive side [of the spectrum]. Usually, when applying a skip-bleach or ENR process, there's a tendency to use a VariCon or Lightflex , since you can use a little less high-contrast lighting to maintain details in the black shades. But I'm approaching the photography the same way I would if *Mouse Hunt* wasn't utilizing ENR, just in case the studio later decides that it's too expensive, and can only do a portion of the prints."



Papamichael shot *Mouse Hunt* with a Panaflex Platinum on Vision 500T 5279 stock; a Panaflex GII served as his backup camera. (EXR 5293 was used for the film's effects work.) In terms of lenses, the filmmakers decided to stay primarily on the wider range of Primo primes, starting with the 10mm and also utilizing the14.5 mm, 17.5mm and 21mm; the 27mm served as the "long lens" for single shots and close-ups. "Most of the time we keep the camera low — waist-high — and shoot up on people to take advantage of the perspective and the depth of the sets," he explains.

The cinematographer's previous pair of pictures, *The Locusts* and *Phenomenon* (see *AC* July '96), were shot in Super 35 and anamorphic, respectively. But he and Verbinski chose the standard spherical 1.85:1 format for *Mouse Hunt* since it would better encapsulate the film's many vertical sets and high ceilings, and scenes shot from the mouse's point-of-view. Offers the cameraman, "The mouse's world will also be shot in the same wide-angle perspective, and since we'll be inside wall spaces we're going to use Panavision's Frazier lens system. We're re-creating their world with a lot of vertical lines and crossbeams to add to the Gothic feeling we've already established.

"There are some shots that can only be achieved with the Kenworthy [snorkel] system: it has a little mirror which enables you to track really low — less than an inch above ground. All the

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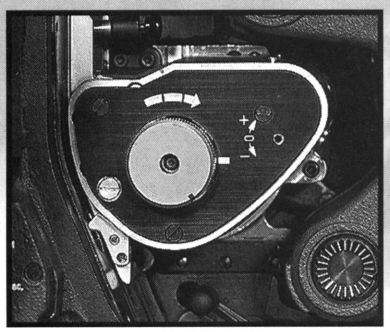
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wall interiors are filled with junk that has accumulated over the years — apple cores, spools of string, pencils, old magnifying glasses. So there are a lot of shots where we're going to move past, through and underneath objects, and the perspective shift of the Kenworthy functions really well for that.

"The interior wall spaces which the mouse inhabits also required a different lighting technique. We needed narrow shafts of light to reach into the tight spaces and achieve the f16 [shooting stop] necessary for the snorkel and Frazier, so I applied hard lighting from lots of little multiple sources [Dedos, babies, 2Ks]. These similarly dark textured sets helped control those hot pools [of light] that I also found hard to cut and control."

Though a CGI and anatromic mouse are being utilized for specific scenes, the majority of the film's mouse-oriented photography was executed with live animals, all of which portrayed the picture's sole mouse. Some 300 of the scurrying rodents were trained in advance for *Mouse Hunt*, each of which had an application geared towards a designated setpiece. But Papamichael found that the creatures' extreme sensitivity did pose problems when the time came to shoot them. "If you any part of the setpiece with your hand, they smell that human scent, stop what they're doing and start sniffing everything out. We couldn't use dulling spray or any kind of smoke because everything effects them immediately."

Rochester Indie Film Fest

Movies on a Shoestring, Inc. is currently soliciting worldwide entries for the 40th Annual Rochester International Independent Film Festival, which will be held from May 6-9, 1998. Winning films will be screened at the Dryden Theater of the historic George Eastman House International Museum of Photography and Film in downtown Rochester, New York.

Submissions will be accepted on 35mm, 16mm and 8mm film, and ¾" and VHS cassettes. Entry fees are $20 prior to January 5, and $30 afterwards; the deadline is February 16th. Write Movies on a Shoestring, PO Box 17746, Rochester, NY 14617; or contact MOAS president Marge Ricotta by fax (716) 473-4490 or e-mail at MOAS@ juno.com. ◆



Mike Hoover puts the OConnor 2575B through its paces filming the 1570 production, "Zion - Treasure of the Gods"

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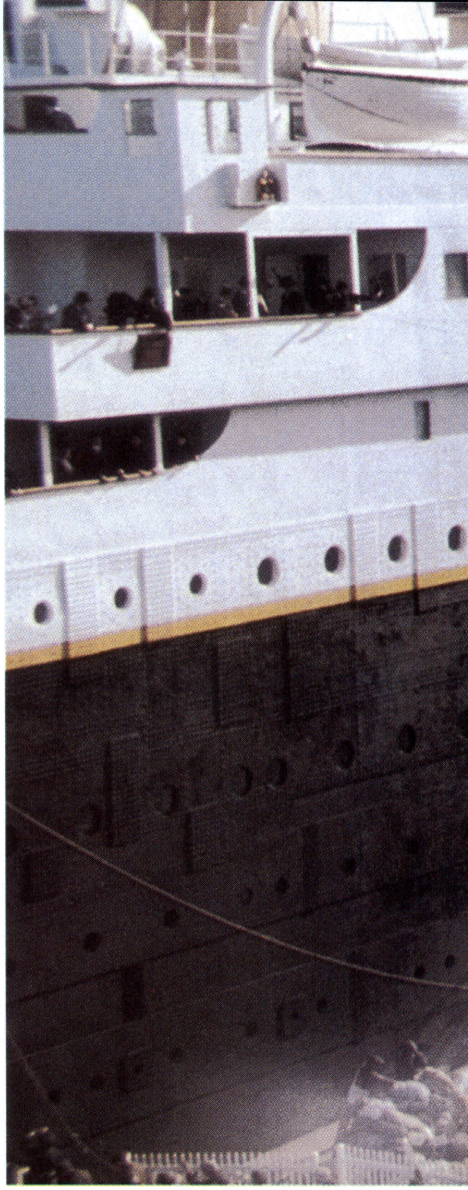
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All Hands on Deck

Director of photography Russell Carpenter, ASC and an experienced crew capture the famed *Titanic* catastrophe on a grand scale — often via surprisingly simple methods.

by David E. Williams



Photos by Merie W. Wallace and Virgil Mirano, courtesy of Paramount and Digital Domain.

When the supposedly "unsinkable" *R.M.S. Titanic* was launched in 1912, its builders believed that they had thought of everything. The ship's design was supposedly flawless; no one could conceive that such a magnificent vessel would ever take on water.



As history has shown us, however, even man's best-laid plans can be undone by the whims of nature. Perhaps this is why the filmmakers behind the epic motion picture *Titanic* were willing to trust their own ability to work out problems on the fly. "In terms of the extensive period of formal testing that I *wish* I'd had on this film, well, there was none of that," cinematographer Russell Carpenter, ASC says with a wry laugh. "My prep basically consisted of [director] Jim Cameron saying, 'You know what you're doing, right?' And of course I replied, 'Yes.'"

Carpenter, who had previously collaborated with Cameron on *True Lies* (see *AC* Sept. 1994) and the 70mm special-venue production *Terminator 2 3-D* (*AC* Aug. '96), is certainly one of the few cameramen who could honestly offer such an answer in the given situation. The battle-tested director of photography's other credits include *The Lady in White*, *The Lawnmower Man* (*AC* April '92), *Hard Target* (*AC* Sept. '93) and *The Indian in the Cupboard* (*AC* Aug. '95).

The sinking of the *Titanic* remains one of the most momentous events of the 20th Century, an incident that shattered society's heady belief that nature was subservient to science. The ship, which embodied the day's state-of-the-art technological advances, became an icon of this folly — at the expense of more than 1,500 lives. Not incidentally, similar themes have formed the crux of several of Cameron's previous pictures, including *The Terminator*, *Aliens*, *The Abyss* and *Terminator 2: Judgment Day*, as well as his screenplay for *Strange Days*.



Cameron's fact-based yet fictional *Titanic* tale consists of two different primary storylines woven together with key visual cues. The first takes place in modern day aboard a research vessel skippered by an American adventurer (Bill Paxton) exploring the wrecked ship. He retrieves the captain's safe, which he thinks may hold great riches. Opening it, he instead finds a waterlogged pencil sketch of a beautiful young girl — a revealing nude portrait inscribed with the legend "Jack Dawson" in the corner. Intrigued, he interviews one of the last living survivors of the *Titanic* tragedy and asks who

Top: *Jack and Rose (Leonardo DiCaprio and Kate Winslet) engage in a cross-class romance. Carpenter eschewed filtration and special film processes while planning* Titanic*'s rich period look, relying instead on atmospheric lighting (bottom), Peter Lamont's detailed production design, and Debra Scott's fine costumes.*



the sketch might depict. Shaken by the sight of it, she begins to tell what she knows.

The second portion of the story begins in 1912 Southhampton, England as poor-yet-crafty Jack Dawson (Leonardo DiCaprio) wins the jackpot in a high-stakes card game: a third-class ticket for the *Titanic*'s maiden voyage to New York. During the cruise, he falls in love with Rose DeWitt Bukater (Kate Winslet), an upper-class American debutante suffocating within the rigid confines of Edwardian society. She returns Jack's infatuation, but is engaged to another man: a dour, monied bore named Cal (Billy Zane). Just as this triangular romance comes to a boil, an immense iceberg tears a 100-yard gash along the ship's starboard bow. The remaining drama is played out deep in the belly of the wounded behemoth, and among the crowds of increasingly panicked passengers on the frigid decks.

The *Titanic* shoot began in September of 1995 as Cameron himself made the first of a dozen 12,378' dives to the actual wreck of the infamous ocean liner. The director's expedition employed twin *Mir* submersibles launched from the Russian research vessel *Keldysh* — the same craft used during the production of the Imax film *Titanica*. One sub served as the filming platform, while the other served as an on-camera star and provided HMI lighting to pierce the inky depths. Cameron photographed these sequences with 35mm Panaflex cameras cradled within high-pressure titanium housings, specially designed by Panavision and the director's brother, Mike. A remote-controlled rover probe was also used to enter the rust-encrusted vessel's innermost compartments, documenting the scene on video. The resulting footage would later be integrated into the contemporary portion of the film, motivated by the fictional salvage operation.

Principal production on the contemporary story thread began in July of 1996 aboard the *Keldysh* off the coast of Halifax, Nova Scotia with cinematographer Caleb Deschanel, ASC (*The Right Stuff, The Black Stallion, The Natural, Fly Away Home*) overseeing the photography. At the conclusion of the Halifax portion of the shoot, Deschanel departed the production for artistic and personal reasons.

In September — with the *Titanic* production headed for the newly built Fox Studios Baja in Rosarito Beach, Mexico for the period/ship portion of the shoot — Cameron asked Russell Carpenter to join his crew. Despite having less

Above: ***The Titanic departs from Southhampton. The dock was built alongside the ship set at Fox Baja Studios. As the ship could only be photographed from the starboard side, all signage was reversed and the footage was later flopped, resulting in this port-side perspective. Some 1,800 extras were used for this sequence.***

than three weeks to prepare for this exceptionally complex production, the cameraman decided that his previous experiences with Cameron, as well as the strong professional bonds he'd developed with his camera team, would help him fill the gaps. "If a crew works with a director of photography for any length of time, they're going to know what his favorite solutions are for any given problem," Carpenter reasons. "Also, most importantly, most of the people I brought to the shoot had worked with Jim before, so they knew the kinds of physical and spiritual demands that would be made on them. I wasn't going to bring any untested people into that situation."

Gaffer John Buckley was one of the first people Carpenter hired for *Titanic*. The two first worked together in 1990 on the action film *The Perfect Weapon;* they had wanted to collaborate again ever since, but the opportunity had failed to materialize. "Gaffers and best boys don't have the luxury of sitting around for six months while waiting for a job," Buckley jokes. "Overlaps in our schedules started to occur, and Russell and I could never get back to it. Fortunately, I was available for *T2 3-D*. After that, I told Russ that I'd try to stay available for him.

"I like working with Russell because he's open to new ideas, but on *Titanic*, we were working on a grand scale, so there just wasn't time to be experimental. When we were on top of the ship trying to light something, there were usually hundreds of cast and crew people waiting between each setup. We often had to resort to simple lighting methods just to get the shots done."

Carpenter inherited other key members of the *Titanic* crew. "One of my key grips, Lloyd Moriarity — who had worked on *True Lies* — and operator Jimmy Muro were on the show before I was," he notes. "Jimmy knows how Jim thinks and cuts, and he can put the camera in the exact storytelling place that Jim will want. This is a process that I participate in, but the three of us really work in more of an English system, where the director talks directly to the operator."

Muro first teamed with Cameron on *The Abyss*, as a dayplayer Steadicam operator working with cinematographer Mikael Salomon, ASC. "Jim and I hit it off pretty well," Muro recalls of the experience. "I chalk our continued relationship up to one simple fact: I was very inclusive of his opinion. He wants a collaborative effort, and if he feels that you're nudging him out, he does not like it."

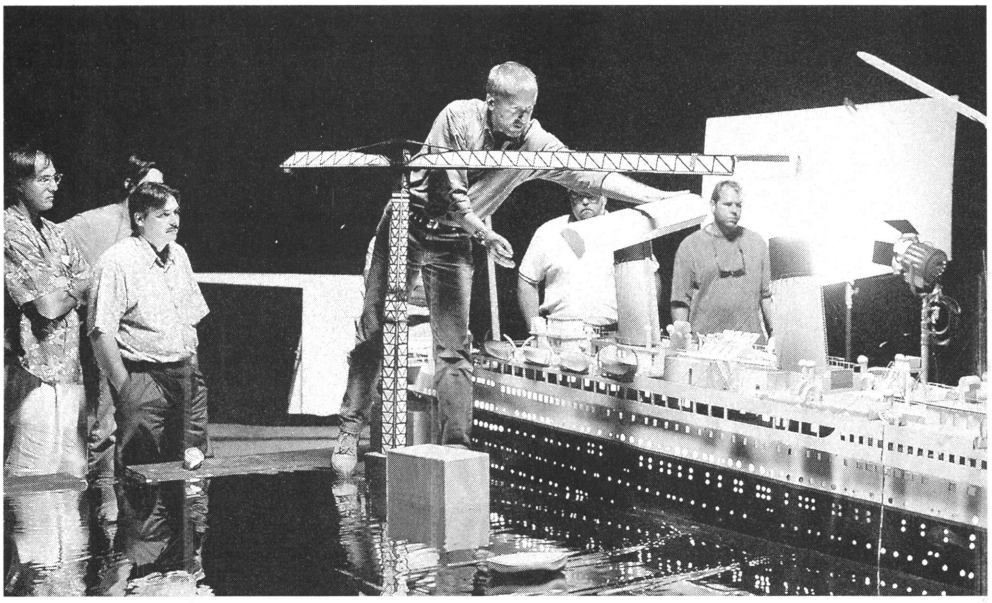
After Cameron had recommended him, Muro worked with Don Peterman, ASC on Kathryn Bigelow's film *Point Break*, and later became the full-time Steadicam operator on *Terminator 2: Judgment Day*, photographed by Adam Greenberg, ASC. Muro joined Cameron again on *True Lies*, operating both A-camera and Steadicam for Carpenter. "It's sometimes tricky when you're brought in by a director to operate for the cinematographer," Muro reasons. "When Caleb [Deschanel] was on the show, I told him, 'I work for you as well as Jim, but you're the head of the department.'

"I've never really analyzed my relationship with Jim, but he did give me some kind words at the beginning of *Titanic*, saying, 'I've come to rely on you, I expect you to be there, and you are.' It was a very human moment. But we have a purely professional relationship and I come and go, because fortunately I've been getting calls for other work. We only work together when our schedules click. I missed out on *T2 3-D* because I was on *Heat*."

Muro describes working with Cameron as being exceptionally demanding, but he also finds the relationship to be inspirational. "I'm blown away by the intensity that Jim works with and the amount of brain capacity he's using to do several things at once," Muro describes. "That's why Jim works well with Russ and me. There are some great cinematographers out there who have a lot to offer, but Jim has enough filmmaking knowledge that he'll ask, 'Why is this light motivated through here? What's your idea for the next scene?' He doesn't like being surprised. The key to working with Jim is welcoming him into your domain and asking for his input."

Filmgoers familiar with Cameron's previous pictures will be interested to see how the director applies his kinetic, decidedly modern visual style to *Titanic*'s predominantly Edwardian-era milieu. "I think Jim got around that really well," Carpenter offers. "There are actually two very different photographic styles within the period section. In the first part, the camerawork is rather polite, graceful and even eloquent. I was trying to reinforce the opulence and beauty of the time with the lighting."

Adds Muro, "At that point, the camera is examining the spaces aboard the ship, drawing the audi-



From left: ***Cinematographer Russell Carpenter, gaffer John Buckley, director James Cameron and key grip Lloyd Moriarity (in white shirt) work out lighting ideas on a model of the* Titanic *set at Digital Domain. The mobile tower crane would become an instrumental tool for both lighting and camera placement during the shoot. Mylar sheeting was used to simulate the water tank's reflections.***



The* Titanic *set in all of its splendor. Drawing 40,000 amps for 3,000 fixtures and rigged with over 30 miles of cable, the 774' 6" stage was built on a hydraulic-actuated gimbal for repeated sinkings. The top two decks were highly detailed for use as a "practical" location.

ence into the elegance, showing them how snotty the rich people were, and illustrating how wonderful the third-class passengers were."

Muro says that the photographic treatment of the film's preceding contemporary scenes adds to this effect, explaining, "In that section [aboard the research ship], we were trying to create some fairly blasé tones — a gray, industrial feeling. We wanted to have the essence of being out at sea, but when we go back in time, it's like, *Technicolor!* As an audience, we never see the past in anything but black-and-white, but Jim wanted the images to just burst off the screen, dripping with colors."

This mood is abruptly broken as the *Titanic*'s hull is ripped open. "At that point, we're suddenly in a very different picture," Carpenter attests. "On some of the sets, like around the grand staircase and other key sections of the ship, we tried to keep that sense of opulence in the lighting until the very end, but the camerawork quickly loses that polite edge and segues into this very kinetic, sometimes violent movement. It's jarring and bumpy, which suggests the panic of the situation."

Recalls Muro, "I hadn't had a chance to read the script before I signed on to do *Titanic*, but I thought, 'Oh gosh, it's going to be a lot of *Godfather*esque beautiful imagery.' But our producer, Jon Landau, said, 'No, no, no, when the ship starts going down, this film is going to *rock!* The audience needs to *be there.*'

"On *Terminator 2* there was this scene we had covered several different ways: long-lens, dolly and then with the Steadicam. Watching the dailies, Jim was very excited by the Steadicam footage and said, 'Look at this, you're *there*, you're out of your seat and moving with the actors through the space.' That was the feeling we wanted on *Titanic*. When the ship starts sinking, we're in there in the middle of it with wide lenses. The ship is going down around *us*. Jim was very clear about that idea from the very beginning."

Despite his longtime collaboration with Cameron, Muro stops to ponder when asked to dissect the director's shooting style. He remarks, "Jim uses more wide lenses than most directors. On *Titanic*, we were making a film primarily about a ship; we weren't always shooting just the actors. The ship is a character in this story, so we're shooting a lot of the environment. Jim likes to see each corner of the frame. I remember one comment he made about *True Lies* that was right on the mark: he wanted to see the money up on the screen. Given that philosophy, we're not going to go really sketchy, especially when we're first establishing an environment. He wants to see half a mile in the distance whenever he can."

As he had on *True Lies*, Cameron relied heavily on the Vid Stick (a handheld video-transmitting viewfinder system designed by Mike Cameron) to devise shots and relay his intentions to Carpenter, Muro, and the rest of the crew. Muro explains, "With the Vid Stick, the frame isn't the sole domain of the operator. On *T2*, I'd sometimes see the lighting encroaching on the frame Jim wanted, and it would be like, 'This is beautiful lighting, but do I tell Adam [Greenberg] or Jim that this is a problem?' We ended up using the Steadicam as a tool for lining shots up and setting the frame — then using the playback to let everyone see exactly what was going on. Not many directors can handle that, but Jim comes in knowing what he wants 90 percent of the time."

Outlining his general lighting approach on the film, Carpenter says, "Early on, Jim, production designer Peter Lamont and costume designer Debra Scott made decisions in regard to the period style, but there really *aren't* any set rules about what kind of lighting is or is not appropriate for a period film. *Titanic* will bear the stamp of Jim Cameron's very blue night lighting. But there's also a lot of amber in this picture, which is quite a departure. With the warmer tones, we sometimes added a bit of a sepia feeling to some of the light, without resorting to using antique suede, coral or tobacco gels. Of course, you will see more color in the scenes with Rose and in the first-class section of the ship, if only in the costumes. That's a natural effect which is dictated by the story. The photographic style was simple, in that I didn't use elaborate filtering systems or other techniques I had experimented with when shooting some screen tests for Jim in *Titanic*'s early preproduction stages."

In preparing for these tests, Carpenter had considered the cinematographic approaches of several other period films, including *Howard's End, Heaven's Gate*

A Perfectionist's Guide to Super 35

Cameron and Carpenter discuss how care and rigid procedures can result in optimum images.

While staunch advocates of the anamorphic process commonly deride Super 35 for qualitative reasons, even the harshest critics often temper their remarks with the words "...except for Jim Cameron's films; he somehow manages to use it successfully."

This is not only a left-handed compliment to the director and the cinematographers with whom he has worked, but to Consolidated Film Industries. The Hollywood-based laboratory has provided processing and intermediate work on *The Terminator*, the Super 35 films *Terminator 2: Judgment Day* and *True Lies*, the 65mm special-venue production *T2 3-D*, and now *Titanic*.

When asked for the secrets to his success with the Super 35 format, Cameron responds with a laugh. "I'm not hiding anything. Super 35 is a very well-thought-out system, but there's a lot of responsibility thrown back on the director and cinematographer to follow it through on every step. You can't just walk away."

Russell Carpenter adds, "I've seen other Super 35 films that have looked pretty good, such as *Top Gun*. People have come up with some pretty exotic methods of reducing the grain and contrast problems in the format, like double-printing their IPs to cancel out the grain patterns, or using a resilvering process to keep the blacks dark. But that's pretty wild stuff — none of which we do."

Selecting the best possible lab for Super 35 work is a vital first step. Despite his relationship with CFI, Cameron always does some research. "I make a film every two or three years, and in that time the labs might make some kind of adjustment in their procedures," he says. "So on every picture, I do a 'cook off' where I put together a test roll of B-negative — sample shots from the film consisting of a day interior, night exterior, and anything else that is representative of the film. You want to give the lab footage that will potentially show grain, like shots with blank walls that are slightly above mid-gray scale. I then have each lab take that through their IP, IN and release-print stages, and A/B compare them."

Outlining the rest of his approach to the Super 35 process, Cameron notes, "It's very simple. First, make a beefy, beefy camera negative. It used to be that anything below a 45 [printing] light was a disaster. Now that most of the labs have retrimmed their point system, anything below a 35 light is starting to feel thin.

"Next, you can't make the image too dark when you're doing your answer-print timing. It's better to be a little light at that point. Then, when you're doing your formatting to anamorphic at the IN stage, you've got a nice fat IP to work from."

According to Carpenter, *Titanic*'s IP, like that of *True Lies*, was made at CFI on Kodak's 5244 intermediate stock, utilizing a wetgate direct-contact printer at full aperture, running at 180 feet per minute. A precision groundglass was used to focus the image through the liquid, while fine-grade filters made overall color compensations. The 2.35:1 anamorphic squeeze was not made at this point, as the IP would also be used to make prints in other aspect ratios.

"Super 35 is only going to look as good as it can due to the lens used in the optical process that and *The Natural*. Other influences included paintings by John Singer Sargent and Caravaggio. "We tried flashing the film very severely, but I didn't like what that did to the blacks," Carpenter remembers. "I also tested several filter packages, looking for something that suggested a 'period look.' Knowing that I might be in situations where there would be 12 or 13 cameras rolling at the same time, though, I decided that discretion was the better part of valor and went with a much simpler filter pack. For most of the movie it was just a Tiffen White ProMist. That way, the actors, costumes and scenery would be telling the period story, as opposed to something I was doing with the lens."

Cameron's desire for extensive camera movement led him to suggest that practicals be used throughout the ship sets, which would keep the frame free of offending motion-picture fixtures. As a result, the top decks of the ship set had twice as many practical lamps as the actual *Titanic*. Carpenter explains, "I know Jim never really thought that practicals could aesthetically light the picture, but his premise was that we should have enough lighting to get a decent exposure just by flipping a switch. That way, when things began breaking loose at the end of the film and we couldn't put a light exactly where we wanted it, we would still be able to get an exposure."

Aiding this lighting approach was the use of the Super 35 format, which would demand far less light than an anamorphic camera system. It's notable that *Titanic* will be Cameron's first feature in which the Panavision logo appears in the end credits; his previous films had been principally shot with Arriflex or Moviecam gear. The change was in part due to the merger between Panavision and Cameron's custom equipment/R&D company Lightstorm Technologies, as well as the positive experience the director had with Panavision while preparing for his deep-water dives. Carpenter submits, "I alternate between using Panavision and Arriflex, and I had just come off a show on which I'd

used Panavision. I really like the Primo primes, but we used the 4:1 and 11:1 Primo zooms quite a bit on *Titanic,* and I found them to be just as sharp as the primes. The zooms also helped because we were constantly massaging our focal lengths throughout scenes — changing from, say, a 27mm on one shot to a 35mm and then to something else for the rest of the coverage.

"We primarily shot with Vision 5279 500T, which I really love. It's a fantastic stock. The blacks are excellent and seem to have a certain luster that I hadn't seen in other Kodak stocks. The 79 is certainly one of the best stocks that I've seen in terms of contrast and shadow detail, and it really holds the bright areas; it's very difficult to blow it out. However, I did expose it very conservatively at an ASA of 320 instead of the recommended 500, and I later took care to avoid any wild changes in the timing that would skew the black areas. These considerations were all related to the Super 35 process, especially the overexposure. You really want to have a meaty negative so that when the optical squeeze is done, you aren't going to see an appreciable increase in grain.

"We wanted to give our focus puller [Mark Jackson] something, so we tried to keep things at T2.8," Carpenter adds. "On *True Lies*, we'd shoot our interiors at a T2.8/4 split, which gave us plenty to work with. We continued with that on *Titanic,* and I also tried to give the very large night exteriors at a little more intensity when I could because I was supporting the 11:1 lens, which has a maximum aperture of T2.8. But we still had to build up the stop."

This meant supplementing the practical lights. "One of the biggest challenges of working with Jim is that he uses such a kinetic camera, which can very often be in several places during a take," Carpenter says. "Most of the places where one would put lights are simply taken away. As a solution to that on this film, we often used very mobile lighting which could move in and out during a take. Some of it was even handheld. At the end of the picture, when the reformats the film to anamorphic while making the internegative," Carpenter states. "You're at the mercy of that lens. At CFI, and also at Deluxe, they have excellent optical systems set up for doing this."

Kodak's 5244 was used again while making *Titanic*'s IN, as the flat IP was reformatted to 35mm anamorphic on the lab's equivalent of an optical printer, running at 14 feet per minute. "The printing stocks Kodak has today are so good that I don't see a real tradeoff in terms of color saturation when you compare Super 35 to anamorphic," Carpenter adds. "Whenever you go through a printing process, you're going to get some degree of change in terms of contrast, but with the new intermediate stocks it's really negligible.

"I've heard that you see more grain in Super 35 because you're doing an optical process. In a contact print, a diffuse light source is used, but in an optical printing process like you use for Super 35, a more specular source is being used. You're therefore seeing more of the grain structure, so you have to present the very best, most pristine negative possible to the Super 35 process."

Toward this end, Cameron has devised a rigid procedure for protecting the negative once it gets to the lab. He explains, "In Super 35 you're dealing with a smaller image area on the O-neg, so you have to be more aware of the accumulated dirt and damage that happens to a negative every time it's handled and a print is struck. In the case of *Titanic* — which cost $190 million and runs 20 reels — the negative cost about $9 million per 1,000' roll. If you take into account what it would take to replace the roll, it has no price. So every time that hourly-paid technician at the lab gets that thing out of the vault and puts it on the printing machine, he's carrying $9 million in his hands. That's like carrying around somebody's baby; you're not going to play catch with somebody's baby too often, so why do it with your negative?

"Most labs will not let you see anything that did *not* work," Cameron adds. "So they'll do a hazeltine timing, make *their* first answer print, correct that and then make another one until they get something acceptable. That 'first' print *you* see may actually be the third or fourth one.

"In response to this, I actually have the lab sign an agreement before we start the answer-printing process stating that they will not make any print without checking with me first. This dramatically cuts down on the number of times that the negative is handled and runs on the machine; therefore, we have fewer scratches, less dirt and a lower potential for damage.

"Another thing we do for safety is to strike an IP immediately after we get a hazeltine timing, even before we make the hazeltine check print. It's just a quasi-timed IP, only meant for emergency use. I've never had to use one, but it's good to know that you have something other than the O-negative if something starts getting ripped up."

Titanic's 35mm anamorphic release prints will be struck from this IN on Kodak's T-grain 5286 stock, as will any 70mm prints. "CFI will take the film though timing and the IP, and then Deluxe will handle the release prints," Carpenter reports. "On *True Lies*, Deluxe did the 70mm prints and they were fantastic. Again, I think this goes back to the improved intermediate stocks we have now, such as Eastman's 5244. Between the 35mm prints and the 70mm prints, there was something like a 20 percent jump in quality and detail. I think they'd be nuts not to strike 70mm prints for *Titanic*.

"Other than watchdogging the process all the way through, the only other special thing I do is to make a very meaty negative," Carpenter reiterates. "But I'm also working with a director who is very involved in this process, and Jim is *not* one to say, 'That's good enough.'"

— David E. Williams



Jack and Rose partake in festivities below decks in steerage. Breaking from his overall source-lighting approach, Carpenter created hot pools of light several stops above key for this sequence, reflecting the energy of the dancers.

camera really gets moving, we'd have an army of electricians acting in concert with the actors and the camera to bring in an eyelight, add some fill, or even pull the key if necessary.

"In very tight situations, running up and down hallways and narrow corridors, we resorted to various configurations of 2' or 4' Kino Flo tubes mounted to fish-poles or sound booms. The 4' wand was called the 'light sabre,' and a pole with two tubes on the end [in a 'T' configuration] was dubbed the 'hammerhead.' Another rig had a daylight tube and a tungsten tube on one pole, so we could switch color temperatures instantly without using gels, or even make the transition in the middle of the shot. We'd have an army of guys with these things, running around and dipping them into position if the camera stopped. Each would then become our key light until the camera started moving again and it had to be yanked away.

"We also made a slight modification on the lightbrush design that Dean Semler [ACS] had come up with [see *AC* Oct. 1996]. We used a Xenon flashlight instead of a Mag-Lite for our source, and we constructed a slightly larger diffusion box, with thicker paper, for the end of it. We often used these 'mega-lightbrushes' just to get some fill in, moving them in an out of shots. It's funny: we had all of these tremendous lighting resources at our disposal, but the final touches for many shots were often added with a wisp of Kino Flo or a flashlight.

"For example, there's a scene in which Jack and Rose have their first kiss down in the boiler room of the ship. There were steam effects, and the lighting in general was very warm. In one close-up, I'd backlit them with a Mini-Brute that had two layers of full CTO on it. But I wanted the light to wrap around them, so we had an electrician handholding a 2' Kino Flo on a pole just out of frame to the side of the actors. I was standing in front of the actors, directly to the side of the camera, directing him. In my hand, I had a very powerful flashlight, a Laserlight, with a little CTO on it, and I just got it right there in their eyes. The camera position at this point was actually the end of a Steadicam shot, so we were all curled up hiding in various places until the frame was tight enough so that we could reach up and get these smaller lights in there." *[Ed. note: This scene has since been deleted from the film.]*

The *R.M.S. Titanic* — an 883'-long, 92 ½'-wide behemoth displacing some 60,000 tons — promised to be a difficult object to render realistically onscreen, particularly since extensive sequences involving hundreds of extras would be taking place on her wooden decks. While considering this problem, the production initially floated and torpedoed ideas involving large-scale miniatures and redressed freighters. It was eventually agreed that a nearly full-size (774 ½') ship stage would be constructed, with the top two decks (including cabins, radio room, and wheelhouse) finished in intricate detail and used as practical sets.

After scouting and rejecting the existing studios that offered water-tank facilities (a process Cameron has previously gone though on *The Abyss*), the filmmakers decided that they would have to custom-build their own facility to meet the project's various needs. A 40-acre portion of oceanside property in Rosarito Beach, Mexico was acquired, and plans were drawn up for what would become Fox Studios Baja.

Constructed of steel pipe scaffolding and wood, the 1,300,000-pound *Titanic* set was built in the six-acre Tank One just a few yards from the Pacific Ocean, which offered a natural horizon line when the ship was seen from the starboard side. To accommodate multiple sinkings, the faux ocean liner was built on an elaborate gimbal system that could repeatedly submerge and raise the set (approximately 40 times over the last six months of shooting) into a 40'-deep well at one end of tank. At full tilt, a 250' stern section was hoisted into the air. Most of the 15.4 million gallon sea-water pool was only about 4' deep.

Great lengths were taken to make the ship set and props feel authentic. Production designer Peter Lamont (*Aliens, True Lies*) began by obtaining the actual *Titanic* blueprints from the original shipbuilders, Harland & Wolff, who had constructed the liner and her nearly identical sister ship, the *Olympic*, in Belfast, Ireland. In addition, Lamont discovered that the manufacturer of the original carpeting for the ship was still in business; he had the firm re-create the exact patterns and colors used throughout the ship. Thousands of props, all based on original designs, were built were for the film, including china plates, silverware,



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Above: ***Jack and Rose struggle to escape the rising waters. For the lighting used in the below-deck flooding scenes, Carpenter reports that "there was one specific technique that was used in*** **The Abyss** ***that we used on*** **Titanic,** ***and that was the bouncing of light off the water surface and into the faces of the actors. The bounce effect worked best with a hard source, so we used HydroPars. By the time the light bounced up onto the actors, it was doing some very interesting things. The walls came alive and danced with light." The set itself was built in Tank Two*** **(right).**

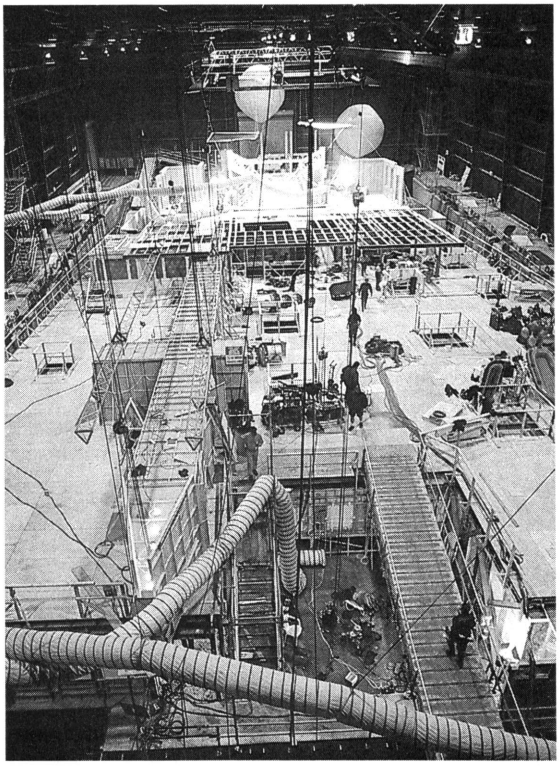
a stunning crystal chandelier, and a brass-detailed Marconi system identical to the model that had transmitted the *Titanic*'s last desperate S.O.S. signals.

At the south end of Tank One, a duplicate stern section of the *Titanic* set was built on a gimbal capable of inverting the structure to a 90-degree angle — replicating the position of the ship just before it fully slipped below the surface.

Additional interior portions of the vessel (such as the grand staircase, ballroom and dining room) were built in Tank Two, a 30'-deep, 4.5-million-gallon pool fully enclosed in a 32,000-square-foot soundstage. The sets were constructed upon a hydraulic platform at the bottom of the tank that could lower and raise them for repeated sinkings. Dry sets were constructed in two adjacent, more traditional stages.

Baja Studios was built over a 100-day period, and as Carpenter recalls, "The facility was still under construction when we arrived. Even as we were shooting you could hear the noise of buildings going up."

The need for a reliable power supply was a major concern, as it had been on such films as *Dune* and *Total Recall*, both of which were shot primarily at Churubusco Studios in Mexico City. "My predecessor had come up with some distribution designs for the studio, but no one had really



tested the power," says Buckley. "The first thing we did was to put a testing device on the current coming off the Mexican grid. We found that it had fluctuations of 40 volts and 30 cycles, which is completely unacceptable for HMI and fluorescent lighting. We could have gotten around the power problem if we'd shot exclusively with tungsten sources, because we'd have been immediately aware of the output fluctuations. But you can't shoot with just tungsten anymore; it simply isn't practical. Tungsten fixtures don't put out enough light — especially these days, when everybody wants soft light and deep stops. We ended up bringing in generators from the States. To give you an idea of the power we were consuming, the lighting for the ship riser alone took 40,000 amps."

Importing equipment quickly became a major headache that would continually trouble the production. "Logistically, we ran into problems," Carpenter concedes. "Due to the delays in customs, we often had to decide what we needed weeks in advance. We couldn't just call up a rental house and have something there the next day." With a knowing smile, the cinematographer adds, "That isn't to say that a piece of gear sometimes wasn't just thrown in the back of a car so that it could mysteriously 'show up' on the set!"

The most effective solution to this problem was to keep an arsenal of production equipment on hand. As Carpenter notes, "By the time we got certain pieces of equipment packed up and back across the border, it would be just about time for it to come back. There *were* days when things sat around without being used, but there were also times when we had the two Akelas, a Wescam, and the Technocrane all in action on the same day."

About half of the Baja Studios crew was from Mexico. "I respected them, and we got along tremendously," Buckley says. "They knew what they were doing, but in the beginning it was hard because some of the [American] crew seemed elitist. Part of that was due to the language barrier. The Mexicans would bring the equipment and the L.A. guys



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Fine-Tuning *Titanic* Images

Cameron employs CFI Laboratories' unique remote color-timing system.

While feeling inventive one day, Consolidated Film Industries' head color timer, Dan Muscarella, imagined a procedure that would allow him to utilize the Los Angeles-based company's INPS (Integrated Negative Preparation System) computer timing system while working outside the confines of the laboratory. As a result, the timing process on *Titanic* could be concluded during sessions with director James Cameron at Skywalker Ranch, located in San Raphael just north of San Francisco. The filmmaker worked very closely with Muscarella while overseeing *Titanic*'s sound mix at the Ranch's famous audio facility.

The INPS program, based on existing software more commonly used in Europe, collects a footage and frame-count address during print projection, and can be input by the user with coinciding RGB timing-light settings, effects notations, and scene descriptions. A finalized INPS file is output as a paper tape, which delivers the instructions to CFI's printers. (In the future, after the printer controls are integrated with the lab's computer system, the digital file itself will run the machine.) The system also allows the user to link shots together, attaching the timing information to any cutback from the same take. Any future timing adjustment will then be automatically updated through the chain.

CFI technical director Richard Smith adopted Muscarella's remote-timing idea and began to plot a procedure that would make it a reality. First, an IBM-compatible laptop computer and desktop docking station was acquired. The docking station was necessary to accommodate the full-size I/O card required by the INPS program. Next, the laptop was installed with INPS, Microsoft Word, and Quicklink II. In addition, a film FCC (frame count cue) interface needed to be installed on any equipment on which the film was to viewed. The FCC would communicate with the INPS program and lock Muscarella's timing notations in sync with the appropriate footage.

For timing purposes, films are normally viewed in a small screening room. However, Cameron prefers to time his films on a three-picture-head KEM table, with the aid of Muscarella and cinematographer Russell Carpenter. "We have the edited work picture on one head, the new print on the center head, and the previous print on the third," the director explains. "We use a foot-lambert meter to true-up all the heads in terms of intensity, and a Kelvin meter to true the color — although Dan sometimes just does those things by eye, which I think is actually better. He uses very fine grades of optical-printer filters to true the color between the various bulbs. From there, we can go though the picture on a frame-by-frame basis, making notations as we go."

The KEM could be easily attached to the INPS FCC counter by way of a custom linkage of Smith's design. With this hardware in place, he planned the physical process that would enable Muscarella and the CFI lab crew to stay in sync despite the nearly 400 miles between them. First, each reel of original cut negative, whether it was an A/B or an A/B/C roll, was programmed into CFI's INPS system. Scene by scene, information regarding FCC, RGB lights, effects, and scene descriptions were input. Once this was completed, CFI staffers struck a print of each reel and created respective diskettes containing the coinciding INPS data.

This package was flown to Muscarella and Cameron at Skywalker for their evaluation, with the print on the KEM and the corresponding INPS file in their laptop. After their color corrections were completed, the updated INPS data was sent back to CFI from their laptop via a fiber-optic telephone line. A new print was then struck at CFI using the updated INPS data, and the cycle would be repeated. Special requests could also be faxed to CFI directly from Muscarella's computer. (As CFI's computer system is refined, the need for shipping diskettes with the prints will be eliminated and the remote laptop will directly access CFI's main server.)

Pleased with the KEM/INPS system, Cameron states, "This method is more accurate than any system that the labs provide. Most timing takes place as you sit down in a screening room. They run the print and you point at the screen saying, 'That shot, no, the one before it, the one where she came into the room...' By then you're at the end of the reel, you've missed 10 different things and you have to watch it over and over again. They just sort of *wear you down*. And if you're doing complex work and assigning one light to a shot that goes from cut to cut, some labs will typically time from a single frame of that shot. Well, that light might have changed two frames later, and it could be completely bogus. All of this means that it will take more run-throughs to get the timing right, which means more wear and tear on your negative. Dan and I feel that on a typical reel of *Titanic*, one without a lot of effects, we can get to our final light in a hazeltine and two first trials. That's pretty low.

"Dan and I used the INPS system on *T2* and *True Lies* [while working at CFI], but the main improvement here is that instead of running back to the lab with his printer information written on paper, he can just modem the data right out of his laptop. That makes it much more precise. And having the laptop tied directly into the KEM — so that the timing information scrolls in time with the film as we watch it — works beautifully. It's a much quicker process."

— David E. Williams

would start taking it out of their hands. I said, 'That stops now. Whoever brings the light in gets to set it.' After the first month, it worked great. I don't see movies just as making a movie. There's a spiritual side to it all, a feeling of brotherhood, and and I try to make sure that that part of the project gets worked out also."

As one would expect, safety was a primary concern for the *Titanic* electrical department — especially since the cast and crew would be perpetually wet during some nine months of shooting in and around sea water. Buckley ran everything on AC current through ground fault interrupters (GFIs), which would immediately trip the power if a circuit was compromised. Individual 20-amp GFIs were assigned to certain fixtures, while custom-built 1,200-amp versions were used for series of lights or large fixtures such as 10Ks and 20Ks. However, the 1,200-amp GFIs played havoc with the gaffer's dimmer system, as they "somehow created an electrical loop inside the dimmers, causing everything to shut down and taking down a whole section of lights. You could set the lights on individual GFIs, but we couldn't dim them all the way out, or they'd trip. It was a compromise, but we went with it for safety reasons.

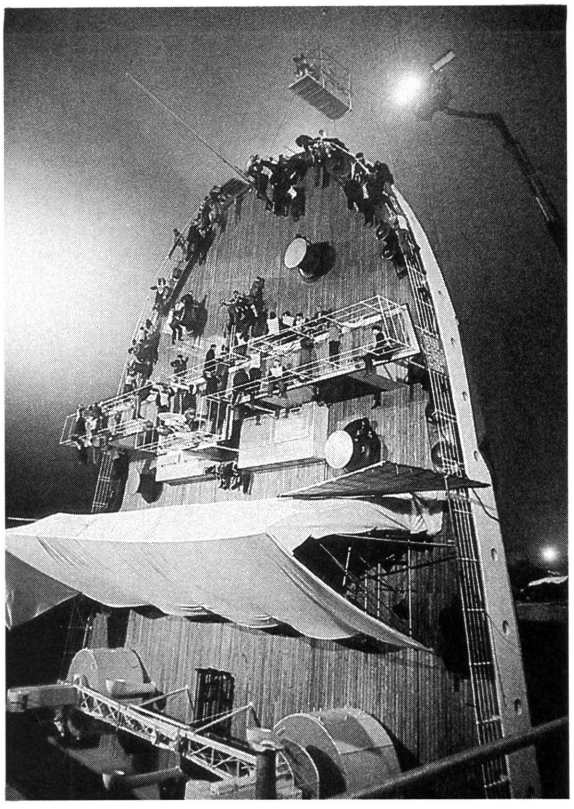
"Meanwhile, I didn't want to burn any HMI or fluorescent fixtures in the water at all," Buckley says. "We did one GFI test by throwing a Kino Flo in the water, and it continued to burn. With the current going through the ballast, the GFI doesn't necessarily read the voltage fluctuation and won't shut down. So unless we had waterproof HMI Pars — which are only 1,200 watts — we used tungstens. At the end of the shoot, when we were sinking the front section of the ship, we had every underwater Par available, from both HydroFlex in L.A. and Pace Technology up near San Francisco."

Additionally, the *Titanic* set's gimbal could pitch the structure to a 12-degree angle. "That doesn't sound like a lot of tilt, but it is when you're actually experiencing it," Buckley attests. "Everything had be to chained or tied down, which slowed us down a lot; right after we'd set everything, Jim might find a different shot he preferred, and we'd have to take everything apart."

Buckley details, "We also built 70 miles of 4/O feeder lines so we knew they'd be clean and that whatever we put in water would be perfect with no cuts. We had 8'-wide carpets of 4/O leading out of the ship and along the edges of Tank One. People coming out of the water, dripping wet, would come out of the tank and walk on these lines. There were two instances where people got shocked, but because of the GFI system all they got was voltage. There was no amperage, which is what will kill you. Nobody was really hurt, although the members of the electrical crew got shocked more than a couple of times!"

As a testament to the complexity of *Titanic*'s lighting scheme, Buckley offers a collection of over a dozen laminated rigging diagrams (see foldout section) detail-





The tower crane basket in use while filming action on the tilting poop-deck set. The greenscreen at the bottom allowed for Digital Domain's extension of the ship and insertion of the roiling sea below. These sequences were exceptionally dangerous to shoot, with the set rapidly going through full tilt and the stunt performers sliding across the decks.

ing each and every fixture that was used on the ship set in Tank One; the corridors and dining room set built in Tank Two; the interior sets depicting the forward hold and boiler room; and other areas as well. The numbered fixtures ran into the hundreds. While simply keeping track of all these lamps was difficult, "the hard part was that we were trying to cheat the laws of physics because we were trying to primarily light the picture with practicals," Buckley says. "Jim and Russ never wanted to shoot under a T2.8. That took us right out of the realm of reality, because we needed such high-wattage globes, and the distances were so great that we couldn't do it. But we *could* get close. Most every lamp we had on this show was either a 300-, 500- or 1000-watt household bulb. They were all encased in watertight housings, so you can imagine the heat that was generated."

The fact that these hot-burning practicals would be repeatedly dunked in 60°F sea water was a major stumbling block, as the rapid temperature shifts would burst bulbs, crack housings and cause seals to fail. Dozens of lamps were lost on some takes, requiring them to be arduously replaced before shooting could resume. Buckley remembers the frustration of the situation: "Jim often said, 'I've been down at the bottom of the ocean with the *Titanic* — we built lights to go down *there*.' But the reality is that a sub goes underwater and stays there for prolonged periods. You don't rapidly bring it up and down."

Despite testing and improvements, the dilemma persisted. "We still had to replace practicals between takes," Carpenter says, "but we developed a replacement system that was reasonably successful."

Creating an overall lighting plan for the ship set was a monumental task. For Carpenter, a potentially problematic *Titanic* fact was that the moon had been in total phase on the evening of April 15, 1912, dispensing with any cinematographer's primary nighttime lighting motivation. Starlight would have to do. The system used to create this soft overall illumination was in constant evolution during the Rosarito Beach shoot. Recalls Carpenter, "When I first came on the picture, we had an immediate meeting over at Digital Domain, where there was as big model of the ship as it was situated in Tank One, with Mylar used to replicate the effect of the lights reflecting on the water. Looking it over, John Buckley, [key grip] Lloyd Moriarity, Jim and I figured that we could primarily use a Musco and a Night Sun from the eastern edge of the tank, as well as lighting balloons on the ship itself."

Fortuitously enough, Buckley, who'd previously used balloons while working with Ron Garcia, ASC, had found some new floating fixtures that seemed right for the job. The gaffer explains, "I'd gone to the ShowBiz Expo in June of '96 and seen a new 16K HMI balloon made by the French company Solaire and distributed by Industrial Wholesale Electrics. When I got down to Rosarito, I ordered two of them."

Caught in a tangle of red tape at the U.S./Mexico border, the first two Solaire balloons never arrived. "There was some question about what they were going to be used for," Buckley recalls, "but we reordered and ended up with four of them. They're great lights, and Russell and Jim loved them, but they have to be used in a very specific way."

In other words, the balloons could only be utilized in relatively windless weather — which soon became a rarity at the seaside Baja Studios as the shoot continued through the winter months. "A lot of thought had been put into where the studio would be built," Carpenter explains. "The tank obviously had to be near the ocean to sell the desired effect, but the surrounding geography was important too. We needed a clear horizon for about 180 degrees, with no mountains or structures in the way. But what wasn't considered were the winds that could come up. By the time we realized how strong they could get — up to about 60 m.p.h. — a couple of the balloons had been blown out to sea."

"The wind was pretty intense," Buckley confirms. "After we had ripped a few of the balloons, we began changing our rigging design. Normally, the balloons are just tethered to the ground, but I wanted another tether on the top so it would be held at two points and couldn't really go anywhere. We ended up using a construction crane for the upper tether, and that system worked really well once we got it finished."

After some refining of the attachment points, Buckley and his crew ordered more balloons, cannibalized parts from the damaged fixtures, and prepared to deploy four of the floating lights. "By that point, we'd done about $120,000 in damage," the gaffer admits. "Everybody got paranoid about the wind coming up, so we didn't use the balloons as often — which was too bad, because we'd finally worked the kinks out of them."

The crew's next approach to lighting the *Titanic* set incorporated one of the largest reflectors ever constructed. Once again, the idea had begun with Buckley's investigations at the 1996 ShowBiz Expo. "I'd found a company there out of Nashville called Tech Incorporated that builds 10K Xenon



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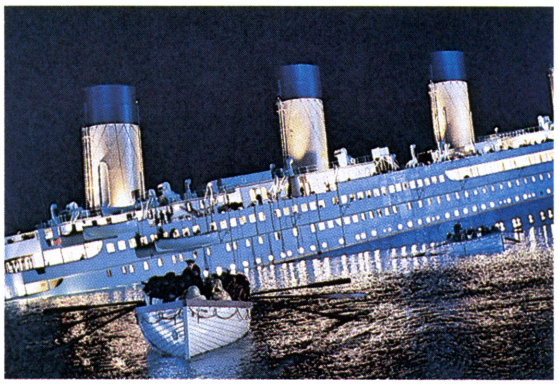


Lifeboats are lowered. During the actual disaster, many of them were only half-full, as passengers dismissed the notion that they were in real danger. Portholes were fitted with either TransLights or half-sets to ensure the ship set's authenticity while under close scrutiny. The set was raised and lowered some 40 times, with each plunge into the 60°F water blowing out dozens of hot-burning practical lamps.

lamps," he recalls. "They hadn't yet gotten into the motion picture lighting business; they built Xenon fixtures for NASA. Their lamps don't have a 500-pound ballast that you have to roll around. Instead, it's built right inside the head, which still weighs only 35 pounds more than the one on Xenotech's 10K. They're also quieter, put out 15 percent more light, and have a dimming knob that will take them up and down by two stops.

"To light the ship, we bounced three of these 10K Xenons into a huge, sail-like reflector rigged to the arm of the 162' mobile tower crane that sits on tracks installed on the floor of the tank. The sail was a 40' x 60' piece of muslin with a silver reflector behind it, mounted on a furling system that could roll up and down depending on how much of it we needed and the wind conditions. The whole thing was mounted to the movable basket on the arm, so we could literally position the sail anywhere within the crane's range. [Rigging key grip] Phillip Sloan built a collar for the reflector that attached to the crane. The sail was secured in place with lines running to the ground, and could be used to illuminate any part of the ship we wanted with a nice warm key, some fill, or do whatever else we needed."

The tower crane arm's weight limits were a primary concern during the development of the furling system, especially since the effect of the wind upon the 40' x 60' reflector could potentially topple the structure. "No one could come up with a correct figure concerning the wind pressure," Buckley says. "We figured that the crane company had given us a low weight capacity figure for their own safety reasons; by keeping the 10Ks on the tower instead of the arm, we kept most of the weight off the extended portion of the rig. It worked extremely well, but as with the balloons, any kind of wind made the furling system completely nonfunctional.



"At one point, Jim said, 'There's got to be something else we can use as a reflector that we can keep up there longer.' He'd noticed that the balloons could handle more wind because they were round, and I suggested using big piece of culvert pipe. We took a pipe that was 20' x 16', painted it white, put it up there, and again used the 10K Xenons. The bounce effect was similar, and the pipe lasted a little longer than the muslin reflector, allowing us to work in winds that were about 15 m.p.h. stronger."

"The wind factor was just worse than anybody thought it could be," Carpenter says. "But there was a constant battle against the weather conditions. We were staying at a place called Popotia, and I'm sure that must translate somehow to 'The Place Where Wind and Fog Never Stop.'"

Carpenter and Buckley also had to turn their attention to the 650 portholes that lined the starboard side of the ship set. To convince 20th Century Fox of his thrifty ways, Buckley accepted the studio's offer of some old 2Ks. "I didn't particularly *want* them, but politically it was the right thing to do because they were *giving* them away. We found out that the lights didn't have barn doors or diffusion heads with them — or even stands. Churubusco Studios in Mexico City offered to sell theirs to us. We bought those for $20,000; it was expensive, but we saved money in the long run because the shoot lasted for so many days."

The portholes were covered with milk glass and the 2Ks supplied by Fox — which ran through 400 20-amp GFIs — were placed behind them within the ship's steel skeleton of scaffolding. As Buckley reports, "The ship looked beautiful all lit up like that, and the lamps created illumination for scenes in which the lifeboats were lowered down the side of the ship."

In his quest for detail, Cameron believed that TransLights depicting cabin rooms should be placed behind the portholes for tighter shots of the ship set. "Beyond others, he wanted to have semi-sets built so we could see people inside the ship," Buckley

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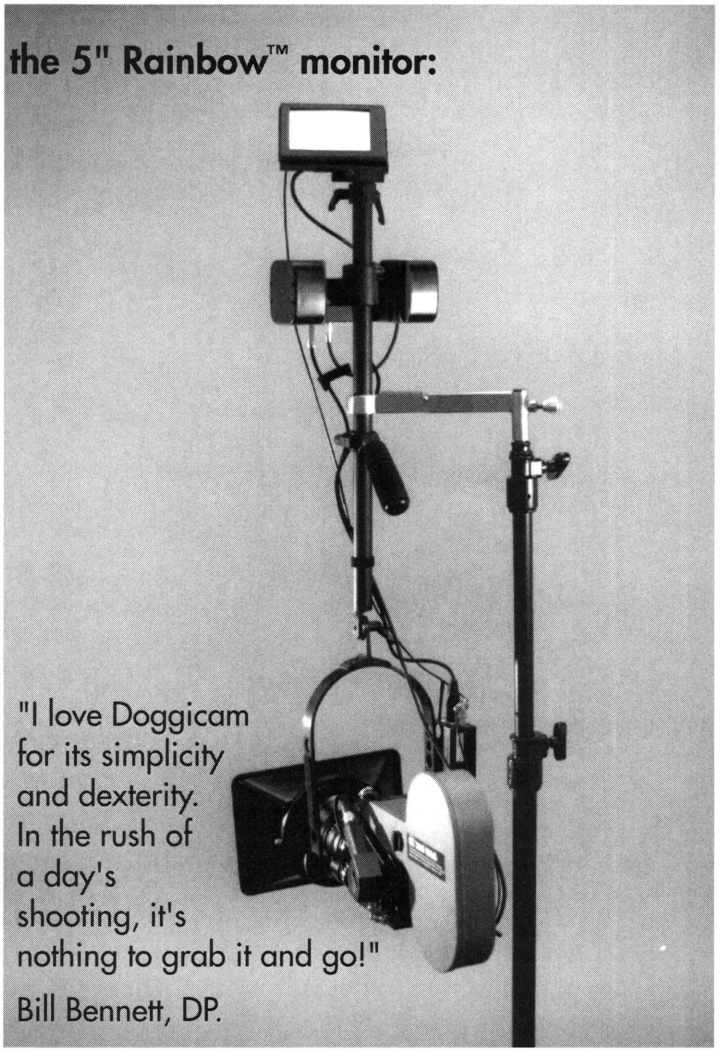
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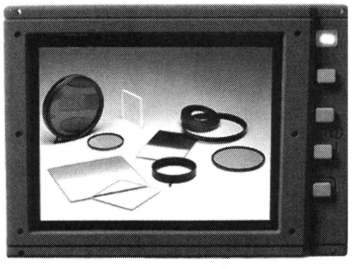
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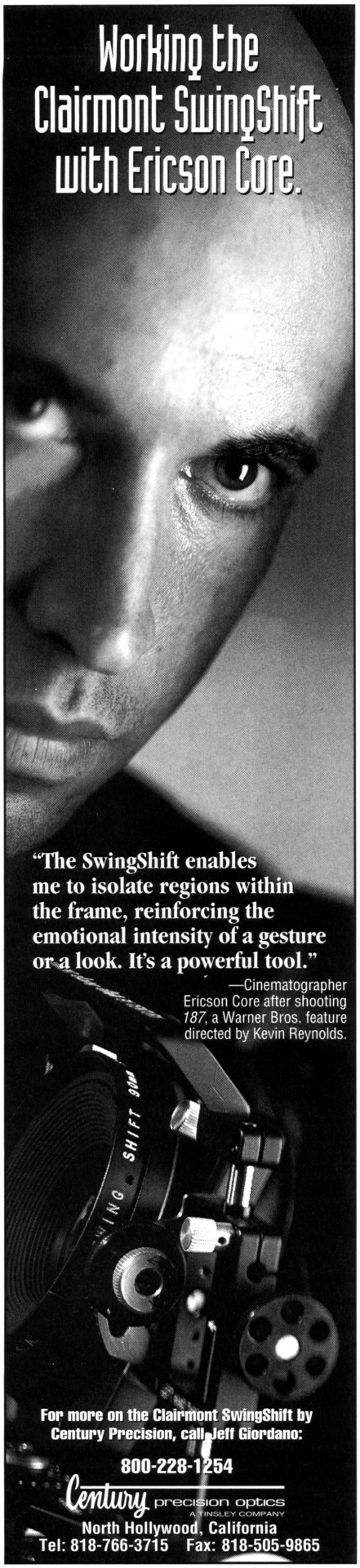


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says. "Because of the way it was designed, the set's steel scaffolding only allowed a 3'-deep area behind the portholes. The scaffolding crew popped up the railing [we had previously rigged our 2Ks on] and pushed it back, but they didn't build anything for us to light from. That screwed up my plan to put the 2Ks back on that level. To solve the problem, we bought about 4,000 300-watt household globes. Four porcelain sockets were put around each of the portholes to light the rooms. It was the easiest and cheapest way to do it. Because most of the shots were made with wide lenses, it didn't have to be overly artistic; Jim just wanted to see the impression of a room and the movement of people inside. The globes worked out well, and ended up saving us $500,000 by the time it was all done. From that point, Jim wisely shot the sinking of the ship sequentially, so we could move progressively toward the bow. I had a strict policy that we would then only use the waterproof Pars."

By using the underwater Pars, says Carpenter, "we could create this glow just below the waterline. But we also used deeper sources in the 40' section of Tank One to suggest that there were lights shining three of four decks below, even though our set didn't go that far down. We built a framework and measured the spaces out so these deep sources appeared to be where the portholes would."

"We had well over 500 of [the porthole lights]," Buckley recounts, "but we again had problems with the lights getting hot and then being dunked in the cold water. We sank different parts of the ship over and over again, such as the hallways and dining room in Tank Two, and the main part of the ship in Tank One."

Carpenter adds, "Testing lights for taking this kind of abuse was absolutely paramount. One solution was to leave the lights off until just before we sank anything. If they were on any longer than 15 minutes, they'd get so hot that they'd just blow out. So we'd light the fixtures, turn them off to allow them to cool, turn them back on, and then go for it."

Lighting the six-acre sea in Tank One after the ship went down was another matter that was hampered by the lack of a "moonlight" source. Compounding the difficulty was Cameron's request that the reflections on the waves not have a specular quality, which might link the illumination to an obvious source. During a nocturnal visit to the *Titanic* set in March, *AC*'s editors observed Buckley and Carpenter's novel solution to this conundrum: a 65' wall, painted flat black, had previously been constructed on the north end of Tank One to block out offending lights from nearby dwellings. Buckley explains, "To create the reflections, we started with some Kino Flo tubes running along the top of the wall, but the effect was too specular. Then we talked about using a balloon, but that was also too specular. Jim just wanted to see an even *hint* of light out there."

In the final solution, fog machines were situated behind the structure, billowing forth a drifting white canopy approximately 40' above the top of the wall. The fog bank was lit from behind with four 18Ks, which resulted in whirling, decidedly non-specular reflections on the water. "It was a pretty smart idea," Buckley admits. "But I didn't get to see the dailies, so I don't know how well it actually showed up."

For James Muro, filming on the decks of the *Titanic* set offered both opportunities and unique difficulties, especially since the first level loomed a full 45' from the surface of the tank. "Our big question was, how do we get the lens up 30 to 60 feet above the ship?'" the operator reports. "That was *really* high. Shooting on decks, we did a lot of Steadicam, but we also had two Akela cranes going. When you see an Akela at a trade show, it's like, 'Man, is this thing big!' But two weeks into shooting on the ship, we were looking around for something even bigger!

"Jim then came with up the idea of mounting a Wescam to the bottom of a big camera basket hanging from the tower crane arm. That really clinched our ability to get new perspectives of the ship. Doing coverage from the deck was

great, but getting a flying angle from above that height was incredible. At first I thought it was going to be like a helicopter shot, but the basket could really get *in there* tight on the action.

"One of the biggest shots we did with the basket was also a Steadicam shot. We put gyros on my rig, went up, and did this shot of the poop deck just as it was going down. We flew over people's heads, looking straight down, revealing the entire thing, while still pulling away. With the gyros going, it was almost like handholding a Wescam."

Muro mainly uses the George Paddock Inc. Pro Sled, but also has a lightweight rig that was built for *Strange Days* by Cinema Products. The operator details, "It's called the SK, which I use with this little five-pound camera that SL Cine makes. We did a lot of the POVs in *Strange Days* with that combination [see *AC* Nov. 1995] and now I use it for any shots where I have to run with actors or up and down stairs. The SL camera takes 200' loads, and the whole things weighs just 16 pounds. The Pro rig with the Panavision Lightweight was 55 to 75 pounds depending on the lens we were using. Fortunately, Jim has such prowess in postproduction that he knows when he needs sound and when he doesn't. That gave me the freedom to use this little SL camera. It may have had some running noise, but it really let me get some fantastic shots."

The decision of whether to shoot handheld or use the Steadicam was "usually an aesthetic choice, but sometimes there is technically only one way to make a move," Muro says. "This is usually decided while Jim is lining up the shot with the Vid Stick. He's examining the frame, and if he's doing a straight push in he might say, 'I want an eye on the eyepiece for this.' But if he buttonhooks around something and makes certain kinds of moves, I know he's going to say, '*Schlamma*,' which is his code word for Steadicam." Muro laughs, adding, "I believe that's derived from a German word, because on *T2* Arnold Schwarzenegger would call it the 'Steadi-*schlamma*.' Now

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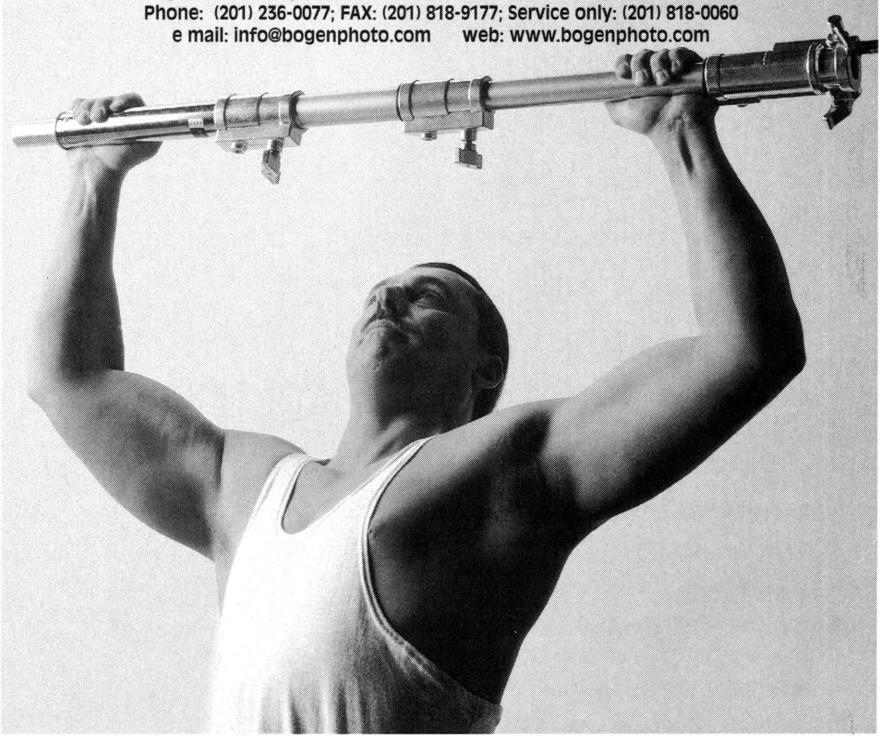
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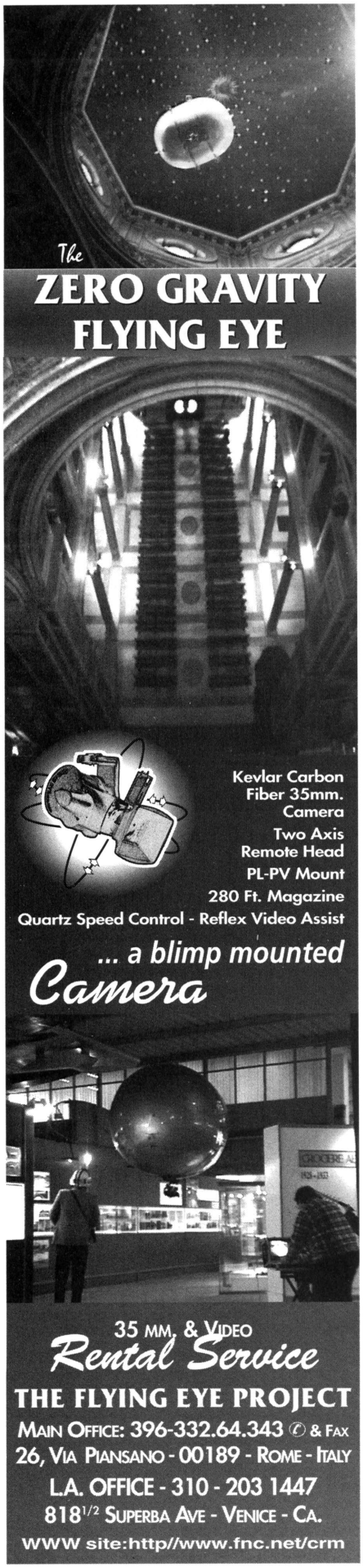
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it's just the *Schlamma*."

Because of the set's sturdy construction, the decking could even support the Technocrane, "but it could take hours to get it into position, because the grips had to hoist it up with a construction crane," Muro says. "Of course, the ship was sinking, and the set was soon pitched at a six-degree angle. You couldn't just wheel the Technocrane around anymore — it was *sliding*. But in that situation, we really needed the telescopic function of its arm, since we could no longer lay track and use a dolly. Leveling the tracks and screwing everything down was a major pain."

In addition to capturing the dramatic action, Muro's work included helping to create the illusion that the *Titanic* set was in motion. "There were a lot of techniques that Jim had in mind before we started shooting," the operator attests. "We often did camera moves on the deck moving from bow to stern, which gave a sense of forward momentum. That was our set language, and we couldn't necessarily move from stern to bow. We had to be careful, because if there were clouds in the background and we tracked left to right past someone, it would seem as if the ship were *turning*. We used that effect for the scene in which the iceberg is sighted and a crewman calls out, 'Hard to port!' We did the dolly to make the ship feel as if it was changing course."

He concludes, "With the camera basket, Steadicam, and cranes, we could cover the entire ship at any moment, which made it hard on Russell and John Buckley. They could be rigging up their lighting for the shot, and suddenly it might change and all of those lights would be in frame. It was almost too easy for Jim to move around, so we had to pin him down lighting-wise to at least one half of the ship at a time, knowing that it would take a half-hour for Russell and John to prepare the other side."

Filming the interior sets in Tank Two was equally daunting, even though weather was less of a concern. Built as true to the actual *Titanic* blueprints as possible, the sets were designed to be repeatedly flooded, so they had to be able to withstand terrific force. "There were no wild walls, so if we had to move even one, it would take a lot of time," Carpenter attests. "For that reason, the dining room [in Tank Two] was built inside a steel frame structure, much like what you'd find inside a skyscraper. Everything had to be bolted onto that steel frame so the set could withstand the pressure of the set being raised and lowered, with tons of water dumping into it. A normally built set would just have collapsed. Because of the flooding, we also had to take a lot of safety precautions in regard to the lighting, just as we had in Tank One.

"The sets were built in Mexico City and brought to our location at Rosarito Beach, where they were reconstructed. Often, they really weren't ready to look at until we were ready to shoot. I would have given my eyeteeth to have one day to test things and really look at how the light worked in these sets, but it rarely happened."

The architecture of the *Titanic* suggested that different lighting be used in the third-class areas, as opposed to the open-air, first-class decks above. "The treatment of the sets down below was very plain and the walls were often just white," Carpenter describes. "There's a major scene that takes place in the steerage common room in which Rose and Jack go dancing at a party down there. If we had just continued with the practical-lighting approach in combination with the white walls, we would have had an almost hospital-like atmosphere. Once I had seen a rehearsal of what the dancers were going to do in that scene, and the kind of energy they were going to add with their performance, I knew I wanted the impact of the lighting to match what they were doing. Toward that end, we made a real deviation from the general lighting plan we were using everywhere else on the ship. Basically, we cut holes in the ceiling and started aiming 5Ks straight down to make these really hot white patches of light that the dancers would pass through. The pools were three to five stops over the key, so for brief moments in a shot we'd get these explosions of

R.M.S. TITANIC

STARBOARD SIDE IN TANK TWO

774' 6"
OVERALL LENGTH

650 22" PRACTICAL PORTHOLES BUILT ON FOUR LEVELS (B, C, D AND E). PRIMARILY LIT WITH 2KS FOR DRY SCENES. REPLACED WITH 500 WATERPROOF PARS FOR SINKING SEQUENCES.

3,000 + LIGHTS ON SHIP (1,400 FIXTURES, 1,600 PRACTICALS) WITH 30 MILES OF CABLE. 400 20-AMP GFIS, 27 1,200-AMP GFIS HANDLING 40,000 AMPS TOTAL.

SEE OPPOSITE SIDE FOR OVERHEAD LIGHTING DIAGRAM B.

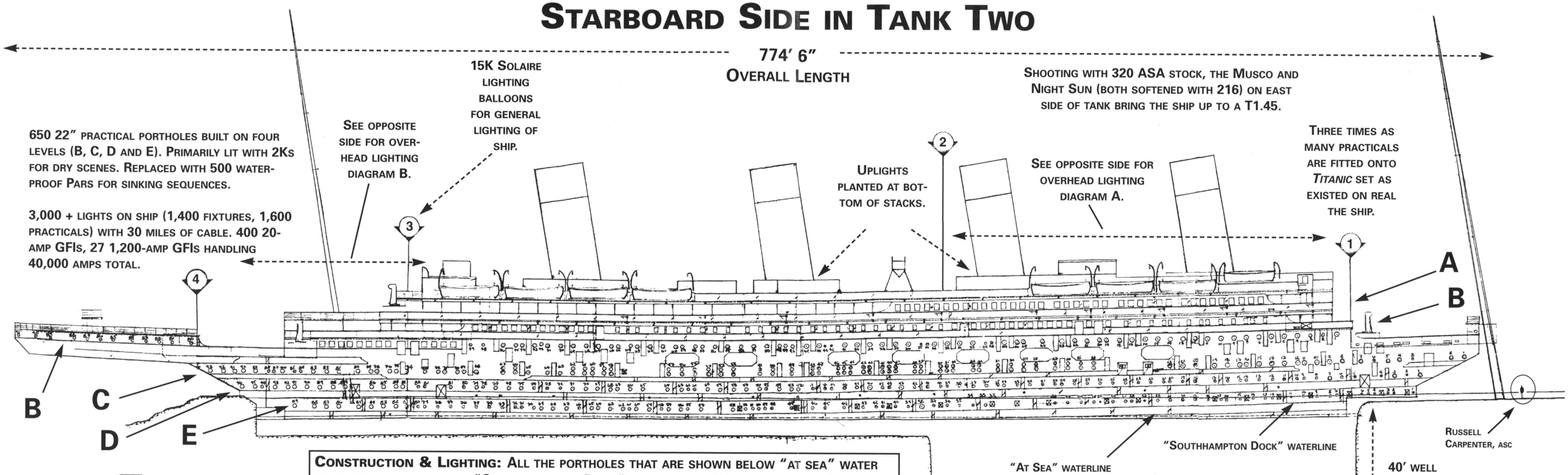
15K SOLAIRE LIGHTING BALLOONS FOR GENERAL LIGHTING OF SHIP.

SHOOTING WITH 320 ASA STOCK, THE MUSCO AND NIGHT SUN (BOTH SOFTENED WITH 216) ON EAST SIDE OF TANK BRING THE SHIP UP TO A T1.45.

UPLIGHTS PLANTED AT BOTTOM OF STACKS.

SEE OPPOSITE SIDE FOR OVERHEAD LIGHTING DIAGRAM A.

THREE TIMES AS MANY PRACTICALS ARE FITTED ONTO *TITANIC* SET AS EXISTED ON REAL THE SHIP.



"AT SEA" WATERLINE

"SOUTHHAMPTON DOCK" WATERLINE

40' WELL

RUSSELL CARPENTER, ASC

CONSTRUCTION & LIGHTING: ALL THE PORTHOLES THAT ARE SHOWN BELOW "AT SEA" WATER LEVEL WILL BE VISIBLE FOR "SOUTHHAMPTON DOCK" WATER LEVEL. WHEN THE SHIP IS "AT SEA" THESE PORTHOLES SHOULD BE COVERED WITH COAL PORT DOORS. WHEN THE SHIP STARTS TO SINK, ALL PORTHOLES ON THIS LEVEL (E) SHOULD BE UNCOVERED & VISIBLE.

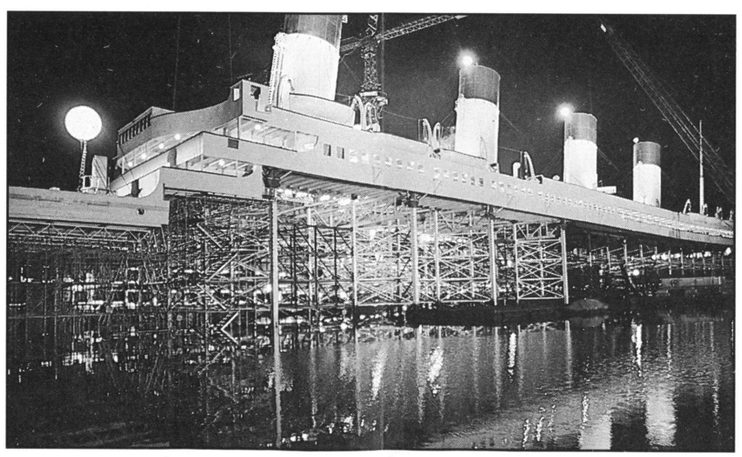
American Cinematographer

SHIP ILLUSTRATION COURTESY OF JOHN BUCKLEY

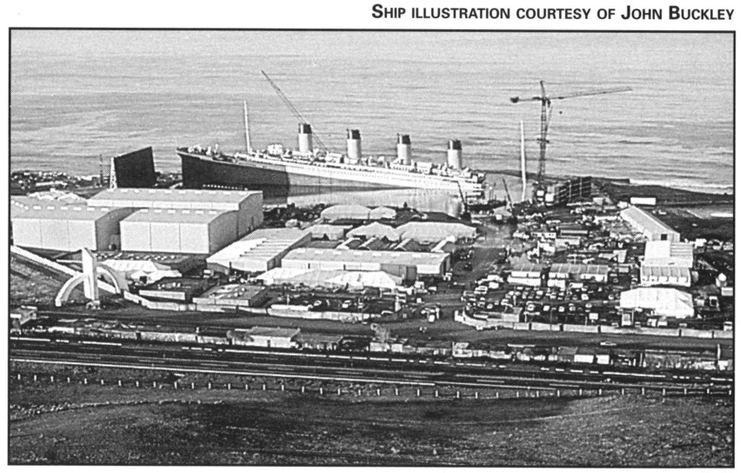


Photos by Merie W. Wallace courtesy of Paramount Pictures.

CONSTRUCTION CONTINUES ON THE *TITANIC* SET. THE INNER STEEL SCAFFOLDING WAS BUILT IN ENGLAND AND SHIPPED TO ROSARITO BEACH, MEXICO. BEFORE TANK TWO WAS FILLED WITH 15.3 MILLION GALLONS OF SEA WATER, THE SOUTHHAMPTON DOCK WAS CONSTRUCTED ALONG THE SHIP AND THE APPROPRIATE SCENES WERE SHOT.



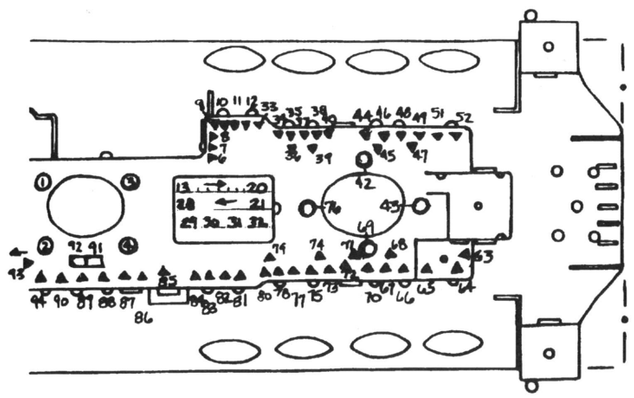
THE UNFINISHED PORT SIDE OF THE SHIP REVEALS ITS INNER STRUCTURE. SOME OF THE HUNDREDS OF PRACTICALS ON DECKS A AND B CAN BE SEEN, AS CAN ONE OF THE 15K SOLAIRE BALLOONS AND THE 162' TOWER CRANE LOOMING IN THE BACKGROUND.



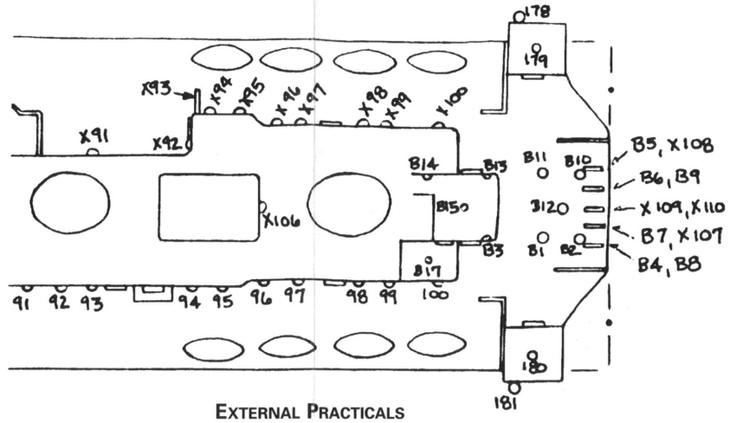
AN OVERVIEW OF THE FOX BAJA STUDIOS COMPLEX, WITH THE SHIP IN SINKING POSITION. BUILT IN JUST OVER 100 DAYS, THE FACILITY FEATURES TWO TANKS (ONE ENCLOSED) AND THREE CONVENTIONAL STAGES.

R . M . S . TITANIC

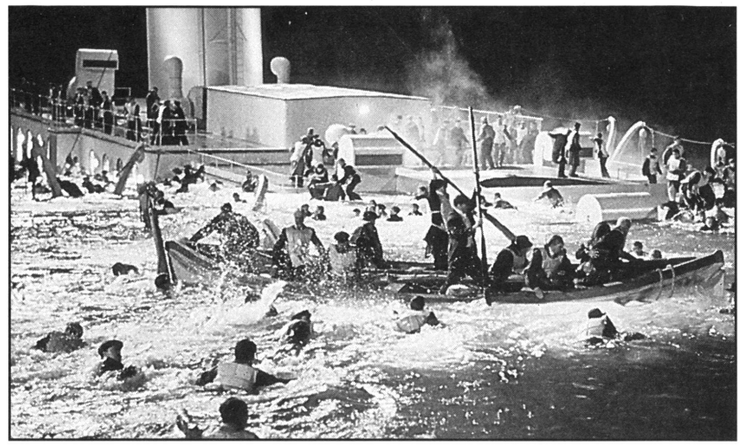
DIAGRAM A : BOAT DECK PRACTICALS AND INTERIOR LIGHTS



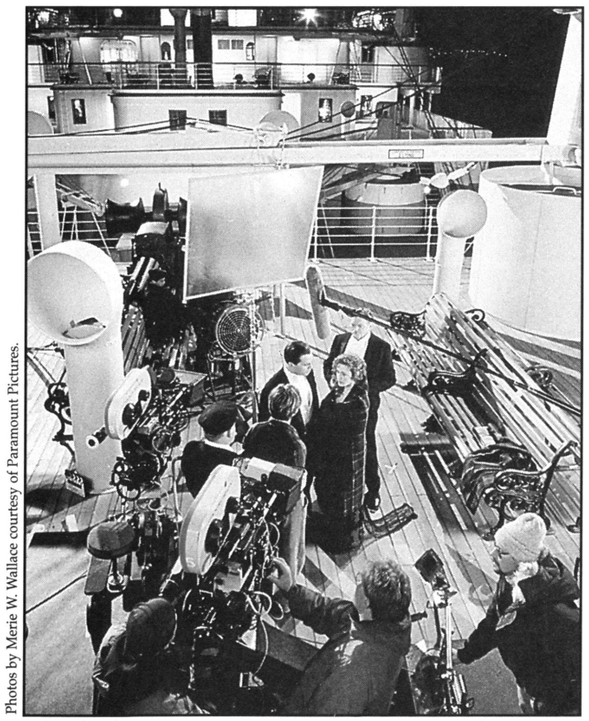
INTERIOR PARS



EXTERNAL PRACTICALS



WATERTIGHT HMI PARS MOUNTED UN THE 40' DEEP PORTION OF TANK TWO HELPED SUGGEST THE MANY *TITANIC* DECKS THAT HAD ALREADY SLIPPED BENEATH THE WAVES. THE SEALED TUNGSTEN PRACTICALS BUILT WITHIN THE SHIP SET BURNED EXTREMELY HOT -- CAUSING MANY TO FAIL WHEN THE 60°F SEA WATER WASHED OVER THE DECKS.

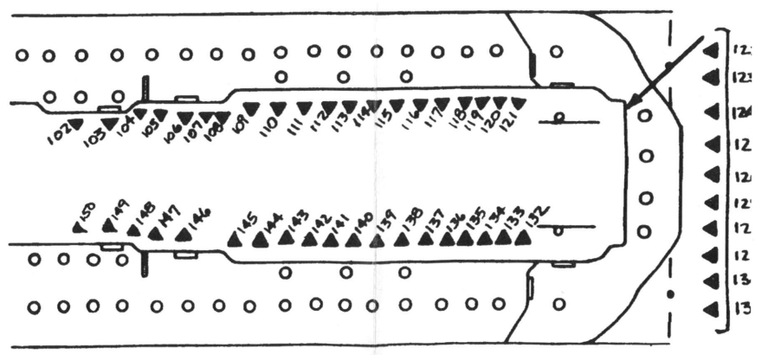


Photos by Merie W. Wallace courtesy of Paramount Pictures.

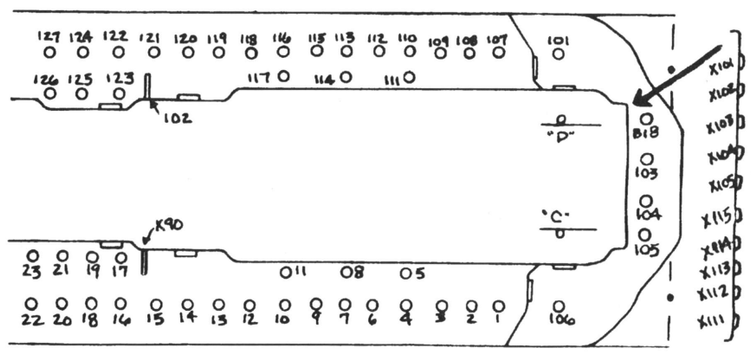
FILMING ON DECK. MUCH OF THE SHIP SET'S ILLUMINATION CAME FROM PRACTICALS, THE MUSCO AND NIGHT SUN ON THE FAR SIDE OF THE TANK, AND ONE OF THE OVERALL SOFT-LIGHT RIGS (BALLOONS, OR BOUNCE FROM THE 10K XENONS IN THE TOWER CRANE). ADDITIONAL FIXTURES USED ON THE SHIP SET WERE KEPT TO A MINIMUM.

THE DECK LIGHTS WERE ALL RUNNING THROUGH GFIS AND GAFFER JOHN BUCKLEY'S DIMMER BOARDS. HOWEVER, HE FOUND THAT RUNNING GROUPS OF LIGHTS THROUGH SINGLE DIMMER CHANNELS CONFUSED THE GFIS (DUE TO VARIATION IN VOLTAGE) AND CAUSED THEM TO TRIP. THUS, KEY FIXTURES WOULD HAVE TO BE RUN ON SEPARATE CIRCUITS.

DIAGRAM B: PROMENADE DECK PRACTICALS AND INTERIOR LIGHTS



INTERIOR PARS



EXTERNAL PRACTICALS

Diagrams courtesy of John Buckley

MOST OF THE PAR LAMPS USED ABOARD THE SHIP RISER WERE OLD STUDIO 2KS "DONATED" BY 20TH CENTURY FOX. DUE TO THE ANGLE OF THE SHIP IN THE SINKING SEQUENCES, ALL FIXTURES HAD TO BE CHAINED OR TIED OFF FOR SAFETY REASONS. MILK GLASS WAS USED ON MANY PORTHOLES, WHILE PARTIAL SETS AND TRANSLIGHTS WERE USED ON OTHERS.

American Cinematographer

energy as they danced and whirled about. We ended up not lighting the walls at all; we just let them fall off naturally to take the curse off this fairly sterile space.

"I would normally figure out a logical source for this kind of lighting, but in this case I just decided that the energy of the scene superseded those considerations. I wanted to take that scene as far as I could before the audience would say, 'Hey, this doesn't make any sense at all.' To do that, you have to know where your boundaries are. Look at what Bob Richardson [ASC] does in his films, such as *Heaven & Earth*. Where are these incredibly hot top lights coming from? It's never explained, but it works beautifully."

As the "Atlantic" began flooding the ship's lower decks in Tank Two, the water played chaos with the sets' elaborate dressings and decorations. Carpenter recalls: "The shooting process was like this: first we'd film the scenes in which everything looks as elegant as possible, representing all the hope and innocence of the time; then, after some modifications to the set, we'd sink it and watch everything go belly up. Take two in the sinking of the dining room set was horrendous, because there were hundreds and hundreds of props: chairs, tables, lamps that had to stay on, china, all of that. It took hours and hours to set up correctly.

"As the ship begins to sink, the camera is often bobbing just inches above the water. There's very little underwater photography in the picture, with the exception of the deep-dive stuff at the beginning. Instead, we're very close to the surface — from 6" to 3' — and we never went really high except for a few shots, because Jim thought that would take the audience away from the actors and out of the picture. We wanted to be right in there with the actors, moving through the same environment they were."

Muro reports that "the roll axis on the Steadicam was extremely useful on the Tank Two sets. The ship was supposed to be at a 12-degree angle and rising. To add to the sensation, we'd just dial

Congratulations

James Cameron,
Russell Carpenter,
John Buckley,
Lloyd Moriarty,

and the
Entire Production Team
on a tremendous
artistic and technical
achievement.

TITANIC

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that in on the Steadicam and go. We often brought in a second Steadicam for some larger scenes, like one in the dining room when the ship is going down, the tables and chairs are sliding all over the place and the water is welling up. Bob Ulland and Guy Bee were with us at some points on the shoot, and we played 'dueling Steadicams.' The dining room was the size of a football field, and it tilted and sank into the tank. In this case, we kept our rigs at true level while the set turned around us. That was incredibly difficult to do, because we had to forget everything we'd ever learned about keeping a shot lined up with the bubble level. Sometimes the instincts of operating the Steadicam would catch up with us, and we'd add a bit of list or dial out some list when we turned 90 degrees to the tilt of the set. That was sometimes frustrating."

Something beyond frustration and closer to fright is the feeling Carpenter describes as he recalls the filming of the flooding scenes. He expounds, "Jim likes to film 'real for real' — that is, to construct a shooting scenario that is as true to the situation being depicted as possible. For example, there are scenes in *Titanic* where Rose and Jack are trapped below decks and the water is rising so fast that you have to wonder how they can get out before they are really crushed into the ceiling and suffocated. Our safety divers were just out of camera range when the actors were doing these kinds of things, where they had just *inches* of space to catch a breath. It looks real because it basically *is* real — except that we could instantly stop the water, and the divers were right there. But the situation certainly put the actors and the camera crew through some paces."

Muro echoes this account, adding, "It was so tight in some of those corridors that once you got in there with the equipment, you couldn't get out. The corridors were built to withstand these huge volumes of water being dumped into them, so the walls weren't going anywhere. Of course, when you're thinking about safety, things *become* safe — it's when you're too comfortable and not thinking about it that things can go wrong. There *were* a few times where we had allowed ourselves to get tired. Even Jim, who has gotten a lot of criticism for working long hours, said on more than one occasion, 'Hey, we're getting diminishing returns here, let's wrap it.' So there were safety concerns. Oftentimes, we'd rework the shot or even remove portions of the corridor ceiling to make sure the shot could be done safely and there would be an escape if necessary. We were amazed by the strength of the water pressure, and all of that water had to go somewhere."

While it may have seemed as if it might last forever, the *Titanic* shoot did finally end, and the ship set, which had become an astonishing landmark for anyone driving down the Mexican coast, was rapidly dismantled. In its wake, Fox Baja Studios remained to welcome a new group of filmmakers.

Despite all the production's trials and tribulations, the $190 million project was certainly a memorable one for the cast and crew. "I was on the show for almost nine months, but I didn't necessarily mind it," gaffer John Buckley concludes. "Jim demands the best out of you, no matter who you are, and that's a joy. This picture was a mammoth undertaking, and I'm really proud of it because I gave it everything I had — as did everybody else on the crew."

Carpenter confirms, "As enormous and logistically challenging as this film was, I feel happiest with the more intimate scenes. This was a great opportunity to show some work that is more delicate than the action-oriented films I've done in the past. I'll remember *Titanic* as a challenge and a testament to Jim's visionary gifts and drive, but perhaps more importantly, I'll recall that I was supported through it all by a group of talented and committed crew members. That's the bottom line for me." ◆

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Captain of His Ship

Director James Cameron discusses cinematography, visual style and Super 35 (among other things) and the making of *Titanic*.

Interview by David E. Williams

There are few filmmakers whose work and reputation speak as strongly as James Cameron's. In just over a dozen years, he has helped lead a revolution in special effects and postproduction, while helming several spectacularly complex productions that not only served as stages for developing new technology, but told compelling stories within fantastic settings.

During our conversation on *Titanic*, Cameron ably fielded *AC*'s queries on a variety of subjects.

American Cinematographer: **Describe the theme of "faith in technology running mankind into the ground" that runs through each of your films.**

James Cameron: [Laughs.] I suppose that is a thematic connection between *Titanic* and my other films, though it is much more magnified in this picture. The sinking of the *Titanic* was one of the great cautionary events of the early 20th Century, and since we're in the midst a definitive technological era, it's still an event that's worthy of notice even as we approach the 21st Century — which promises to be an even more technology-based time. The problem is that technology is largely invisible to us because we adapt to it so rapidly. We live in a world that has been transformed in the last decade by the personal computer, yet we don't really sense that there has been a profound change. But the *Titanic* incident isn't just a cautionary tale, it's a true event, which I think is another thing that gives the film such great power. In terms of visualizing the picture, we wanted to give it a great sense of reality and not over-stylize it.

How can you visually convey to an audience that the *Titanic* itself was state-of-the-art in its day, and that boarding that vessel in 1912 was akin to people today climbing aboard a spaceship?

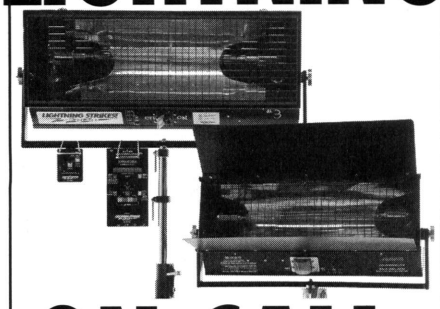
Cameron: It's hard to do that, because there are certain things about the technology that just seem antiquated and quaint to us now. For example, the telephones on the *Titanic*'s bridge are goofy old-style telephones with earcups. But you can convey the fact that people thought this ship was the cat's pajamas through the actions of the characters. They have to react to the technology, as well to the design accomplishment of the *Titanic*. The ship was grand and majestic and had a look that was unlike any ship of its time, with its four funnels and long, straight lines. So part of what we do in the film is to get you to know and love the ship as a character, and get the audience to put themselves in the mindset of the people coming aboard with their optimism. I had to work against 85 years of history in which we've associated the name *Titanic* with gloom and doom. Photographically, everything in the early stages of the story was designed to be bright, open and cheerful — sunlit — as the passengers come on board. The light is actually very rosy and warm throughout this early part of the film; everything is great, and these people just don't know what's coming.

What was your process in adapting modern filmmaking techniques to this period story, and how have you told it in your own visual language?

Cameron: You always have to think about what's grammatically correct for any film in a visual sense. Is it correct to use a lot of the new technology, with sweeping camera moves and so on, in a story that is essentially a period story? I think the answer is resoundingly yes, because what I was trying to do is break through these barriers that have been put up around period films. Some people think a period film has to be shot like *Barry Lyndon*, with a very proscenium-style frame. I wanted to shoot *Titanic* like a *Terminator* movie. I wanted it to have the subjective immediacy of my other

Cameron (center, with beard) supervises shooting in the* Titanic*'s flooded dining room. Long-term shooting in the chilly sea-water tanks required the use of insulated survival suits.

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films, like *The Abyss* or *Aliens*, where you're *inside* this thing. I wanted to put the audience inside the *Titanic*, so we used sweeping Steadicam shots moving through corridors. It's as if the *Titanic* really existed today and we could take it out to sea and fly around it with a helicopter, shooting with a Wescam or something like that to get these beautiful shots. We couldn't *really* do that, of course, but if you can imagine doing that, then you can imagine what your visual effects will look like [see separate story on film's effects].

I remember having an early conversation with someone who said, 'Well, [shooting from an aerial perspective] would look odd because they didn't have aircraft back then.' That was the total opposite of what I believed. I wanted to tell a story that's set in 1912 utilizing every modern tool that I could think of. However, I didn't want overly modern stylization, or anything that one would associate with a current trend in cinematography. I wanted to use my tools to the fullest dynamic spectrum available, but always use them correctly in a dramatic sense.

David Lean made period films like *Lawrence of Arabia* and used the state-of-the-art filmmaking methods that were available at that time. I remember seeing *Doctor Zhivago* for the first time, and there was this huge sweeping crane move that was absolutely breathtaking. They certainly couldn't have done that in 1917 during the Russian Revolution, so I think this argument is moot. Most people would accept the fact that you use the modern tools, but then the question is, what is the visual style for the film that does not seem anachronistic to the audience?

I found while making *Titanic* that I was spending more time in a wider frame. On *True Lies*, I was in a looser frame than I had used in *T2* or *Aliens* because the intensity level was different. It was comedy, and actors use their bodies to a greater extent in comedies. So I was cutting the bottom of the frame at the waist, or even midthigh, on a lot of master shots. But on *Titanic* I was across the room. And although I wasn't trying to emulate a particular style, we used a sort of deep-focus effect, where we were using a wider focal length and had the actors in the foreground with all of this pageantry behind them in depth. This is opposed to a long-lens effect that would just collapse the space and make it all abstract.

I think long-lens photography is in response to our kind of contemporary landscape, in which a little piece of an out-of-focus neon sign will be read as 'city.' You don't need to actually *see* a city, because you understand that image. But I wanted the eye to be eating the *Titanic* up like a pizza. So we used depth of field and didn't make the backgrounds too soupy.

I think the film owes more stylistically to the Technicolor epics of the 1940s and especially the '50s, where they were moving the camera a lot more often and letting the actors play the frame, but still slamming in when there was a dramatic moment. They used close-ups more sparingly than one might in a completely modern style.

There was not an overt attempt to do an old-fashioned cinematic style on the film. Quite frankly, I'm not well-schooled enough to do that. I can only respond to what I see and what I'm trying to express. But I wanted the audience to have a great sense of the reality of the environment, because I thought it greatly informed the dramatics of every scene. Source lighting was very critical to this, for instance. We always wanted the lighting to feel highly organic to the scene.

What thoughts did you have in creating the photographic approaches to the three primary parts of the film: contemporary scenes, the Gilded Age, and post-iceberg?

Cameron: Some of these questions are only now getting sorted out during the color timing of the film. We didn't use any big process, and wanted these touches to be subtle throughout the film. The picture really has a 'styleless style,' in the sense that we tried to make it unobtrusive and dramatically correct for the given scene. But I didn't want to have a dra-

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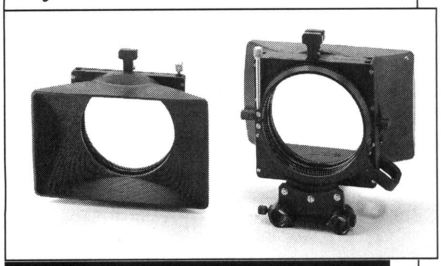
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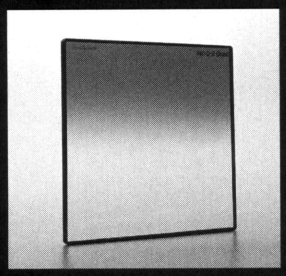
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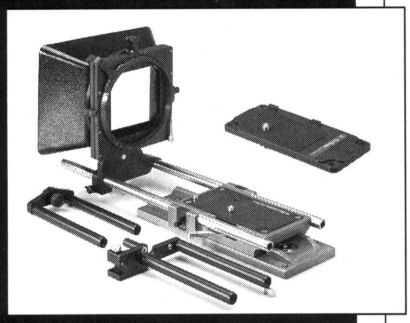
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matic difference between the present day and the past; instead, I wanted to create the sense that you had traveled in a time machine and ended up right there in 1912.

Ironically, as a result of [Caleb Deschanel, ASC departing the production after photographing the contemporary portion of the shoot], we have an inherent stylistic difference between the film's present-day section and the scenes that take place in the past. I'm not saying things were contrived to happen that way — they weren't — but that's how it turned out, and I think it works to the benefit of the picture.

However, I also wanted things to look beautiful when they should. You have to do some interpretation there, to soften the image and the lighting. One key thing is that the light hardened up a bit when we went outside for the period night scenes, and a lot more once the passengers were in the water. The lighting is very soft in the interior scenes aboard the ship, especially in the first-class spaces, where there are never hard shadows on the faces. I especially wanted to achieve this on any shots of Kate [Winslet]; we almost wanted her to look as if she was lit from within. But that's just a goal, and you can't always achieve that.

For the present-day sequences, I thought about doing some really overt stuff, like leaving off the 85 filter and letting it go really blue, giving it a 'high-tech' feeling. That turned out to be too stylistically intrusive, partly because we have this character Rose [the elderly version of Kate Winslet's character, played by Gloria Stuart], and I didn't want her to be photographed as if she was 'high-tech.' The compromise was to use a cooler look in present day, but also to emphasize high-tech source lighting that they would not have had in 1912, such as fluorescents. In scenes featuring old Rose in this high-tech environment, we let everybody else in the scenes fall into this cyan-blue while keeping her in white light, which left her as the most human of the group.

We shot all of the period scenes so that there was quite a color separation in the night exterior photography. Russell [Carpenter] would go almost full blue on the ambient fill that lit the ship, but then a quarter or even half CTO on the white light, so they were pulled apart just a bit more. In the timing stage, we are deciding how warm or cool we want the white lighting to look. Dramatically, it's turning out like we anticipated at the point of shooting, with the white light always a bit warm to suggest the sanctuary of the ship. We always want to be historically accurate, since electric light in those days was not at the voltage we use now, and the light tended to be more like candlelight. But that dynamic works against the pervading sense of cold on the deck of the ship, as the disaster unfolds in this sort of a nightmarish slow motion. So we're going a bit colder in the blues in the later scenes than we thought we would during production. The beauty of this is that we have the flexibility because our colors are far enough apart.

One might suppose that in the 1912 sections we'd wash it all in this golden yellowish mask to give an antique feeling, but that's not the idea at all. Instead, after you go through this dreamlike transition to 1912, you're *there* and it's *real*. So the idea is to go almost neutral in the color response, where the blues are blue, the reds are red, and the yellows are yellow and everything is vibrant to the best extent that the Kodak negative can render it. We didn't want to stylize it and interpose a barrier between the film and the audience; we just tried to do really beautiful, elegant lighting on a shot-by-shot basis. Do you want backlight and shafts of sunlight coming through the windows? Great, we did that, but then we backed off just one step so we didn't end up with something that looked like an extended dream sequence. Everything was in proportion — richly textured, and a beautiful interpretation of reality.

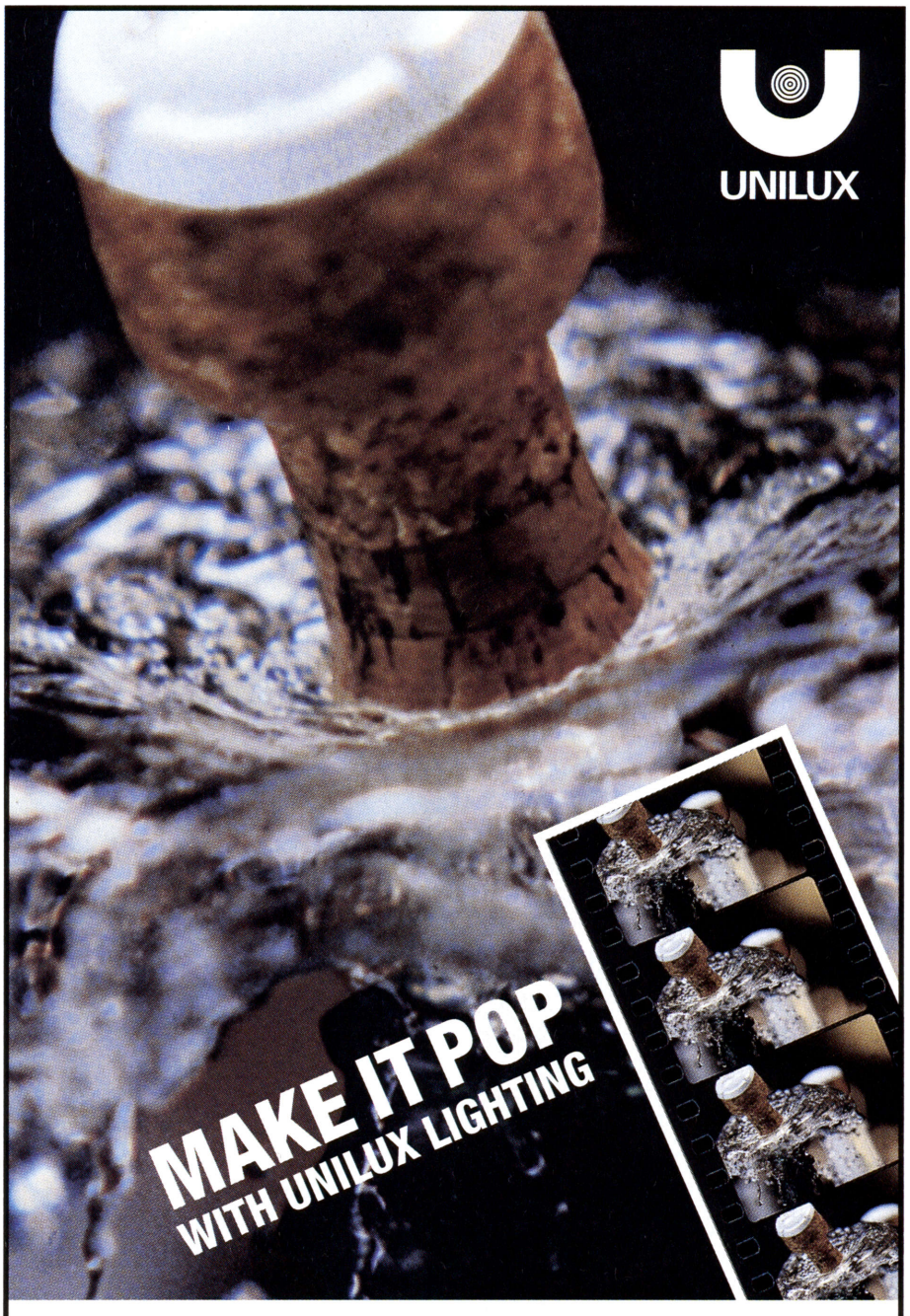
That style later evolves as we get deeper into the disaster and the scenes below deck: the camera moves become less elegant and more nervous. There's a lot more handheld work and Steadicam, and it's rough, which creates a

sense of pervading panic in the camera movement. That's something that Russ, Jimmy [Muro] and I worked out. I warned Russ in advance that the camera was going to be jumping around.

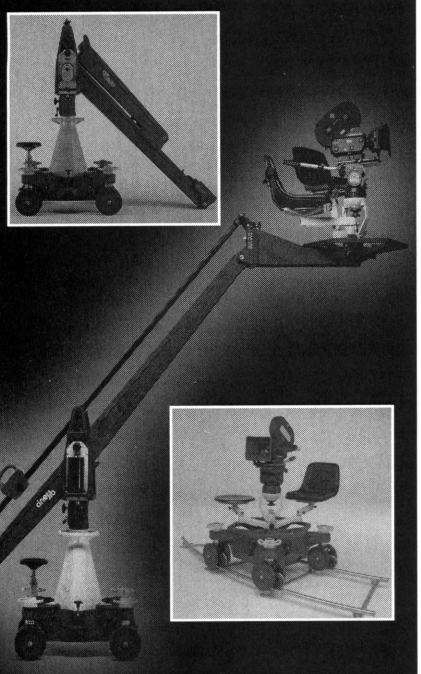
Can you give me an impression of the procedures and tools that you, Russell Carpenter and Jimmy Muro used while shooting on the ship set?

Cameron: Because of the scale of that big ship set, with the lighting instruments it required, every scene had to be very carefully worked out. The Vid Stick was very handy in terms of previsualizing shots, but it just wasn't a situation where we could come in and say, 'Hmmm, I think it would be nice if we did it this way,' and then turn the shot over to Russell to light it. He would have had 10 hours of lighting to do. We had to anticipate what we wanted to do well in advance. Shooting on the ship went very slowly at first, but after a few days we learned the ground rules of that set and how we had to place the big lighting instruments — like the Musco, the Night Sun and the balloons — so they didn't reflect in the water and create dappled lighting all over the sides of the ship. The end of every shooting day would be a briefing on the next lighting positions for the big, hard-to-move fixtures. This is a standard process.

A Musco can move pretty fast, and on a standard shoot you can change its position in 20 minutes. But if we had to move balloons, towers, Muscos and a Night Sun, we could be looking at four to five hours of work, and that could kill us. Fortunately, we had spent a lot of time previsualizing the situation and had actually designed the tank facility with the aid of a scale tabletop model, with a sheet of Mylar standing in as the water surface. We created a berm around the perimeter of the tank model, and Russell cooked up what was essentially a miniature Musco that was in scale to the ship in terms of height and intensity. From there, we figured out what the lighting would look like, and picked out specific places on the berm from which we could light things.



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Using a bounce light hanging from a tower crane was an idea that came directly from those tests on the model. I knew that if we did not have complete flexibility in the lighting, and if I couldn't literally walk from one end of the ship to the other and do a scene along 400' of deck in the latter half of the day, there was no way that I was going to be able complete the film on schedule. That resulted in the development of a furling system on the crane arm.

As the shoot evolved, the lighting balloons we used for this purpose turned out to be a nicer light that withstood wind conditions better — although they were harder and slower to move — while the tower crane turned out to be an ever-more-powerful tool for placing the camera. Working with a set of that size and that height proved to be remarkably difficult. We knew that going in, but it took us a surprisingly long time to come up with the tower crane as a solution. We had first turned to the Akela crane. We went out and did a test with an Akela at one of the studios in Culver City, and it *filled* the street. We were like, 'Wow, this should do it!' But when we got it out next to the ship set, it was a joke. We then thought we could put the Akela on a 30' platform built on barges, which we could float right up to the set. That worked, but the real breakthrough in getting angles on the ship didn't happen until we figured out that we could hang a gyrostabilized camera from the basket on the crane arm, which allowed us to put a camera anywhere on the entire set in a matter of minutes. We couldn't have shot the picture without it.

Our approach to the film was to try to present, in human terms, an event that is far outside human scale. Therefore, there were only a few times when I wanted to do the big wide shots of crowds on the decks to show the greater story that was happening. I instead tried to start on a wide shot, come sweeping in on a recognizable character, and then punch in closer. That way, we'd always have a human connection. I also thought it was important to know where people were geographically, so a lot of the wide shots evolved into closer shots. This, of course, was a photographic approach that hadn't been used on any previous *Titanic* films, because they didn't have a big enough set or the visual effects to back them up. The shots that interested me the most were the ones where you saw the ship and understood its size and then came closer for a specific piece of dramatic action.

This idea was used most importantly for a scene in which Jack and Rose are embracing at the bow of the ship. They start out as two tiny dots only a few pixels high, relative to this monstrous ship coming toward the camera, and we sweep right up on them into a pretty tight shot.

Can you describe the early screen tests you did with Russell Carpenter during preproduction to develop the period atmosphere?

Cameron: We did some tests, and they were very promising, but they were really ridden in on the back of auditioning some of the actors. They weren't formal photographic tests. Part of the testing was my insecurity over not having done a period film before, and wanting to see if I could work with a given actor to create a sense of the time period. I wanted to test that on film.

We tried flashing and overt diffusion and all of the other classic techniques for suggesting period, but they all struck me as barriers that would stop the audience from directly experiencing the events in the story. We really got into our true testing phase for this during the two weeks before starting principal photography [at Baja Studios]. During that time, we started experimenting with more subtle techniques, like light filtration. A half ProMist ended up being the heaviest filter we ever used; a quarter was more standard. We also used very light smoke, just to soften the backgrounds and the lighting. We wanted rich color saturations and strong color separation between the warm and cold tones. That way, if we wanted to, we could warm all of the lights by

adding a couple of points of yellow and some red in the printing; the blues don't disappear. We coordinated these later camera tests again with wardrobe tests, which was also a sneaky way of figuring out how to light the actors.

Another thing Russ came up with was the idea of filling at a slightly cooler temperature than the key. You can't have warm without cool — your eye just gets acclimated to a lot of yellow and doesn't appreciate it as warm anymore. Then you have to dump in even more warmth to make it stand out, and all of the beautiful colors in your wardrobe disappear. Russ was filling with quarter-blue or even half-blue; that way, we could time the whole thing over so the fill would no longer be perceived as blue, and the highlights would suddenly get this beautiful golden feel. I think it looks amazingly rich and has a lot of depth.

On our last couple projects, Russ and I have really done a lot with controlled overexposing to enrich the blacks. Doing this is like 'safe sex' for digital effects work — you never know when a piece of negative will become a piece of digital internegative. These days, you should be prepared to do effects work on every single shot. The more information you have on the negative, the better.

This leads directly into the subject of Super 35. You're certainly one of the format's strongest advocates.

Cameron: It's a God-given format, and now that we're in the digital age — although not everybody is yet — you can reposition a shot, axially stabilize a shot if it has a little bit of roll, and so on. It's like shooting in VistaVision while being able to use lightweight sound cameras. Granted, VistaVision simply gives you a lot more negative area, but most of the problems with framing in the 'scope aspect ratio are vertical. Having additional vertical frame material available means having the option to reposition shots and even do moves within shots. Sometime an actor's head dips down in frame slightly, but with Super 35 you can chase him and reframe the shot, either

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optically or digitally. We probably have 100 shots in *Titanic* that were trimmed vertically after the fact.

Any argument against Super 35 went away a few years ago when Kodak came our with their T-grain intermediate stocks. I defy people to compare it to anamorphic, which has its own problems. In anamorphic, you're going through an anamorphic lens when you're shooting and then going back out an anamorphic lens when you're projecting. Each anamorphic stage causes lateral smearing of the image, which leaves lighting artifacts that I don't like. Whenever you have lens flares in anamorphic, you get these straight lines all the way across the frame. Some people like those, but I think they're ridiculous and don't correspond to anything in the way the human eye sees things. People associate that effect with 'big movies,' but that's just because for a long time big movies were all shot in anamorphic. So some people think a picture has that 'big movie' look because the headlights on a car create these white lines that go from one edge of the frame to the other. That doesn't correspond to anything I see in my daily life.

Anyway, that's a stylistic choice. The compelling factor is that the intermediate stocks are so good today that the loss of O-neg area is relatively inconsequential. In Super 35, you *are* losing negative height vertically, but you're gaining horizontally. You're not gaining as much in anamorphic as most people think. It's not the difference between half-aperture and full-aperture, which is an oversimplification. I don't know the exact figures on [image area loss], but if you follow the rules of good, clean hygienic photography and printing in Super 35, you'll end up with something that in the mind of the audience is indistinguishable from anamorphic or better. Super 35 just lacks certain anamorphic artifacts that I think are detriments, and I much prefer that look.

What about increased grain, the most common detriment that critics of Super 35 bring up?

Cameron: Do audiences care more about grain or focus? Where are you more likely to be out of focus, when your wide lens is a 25mm or when it's a 50mm? Focal length is focal length, and depth of field is a result of focal length. If your medium-wide lens is a 50mm, you're going to be out of focus more often, and your Z-axis is going to be a very shallow plane. Some cinematographers like shallow focus, and if that's the case, then anamorphic is not a detriment to them. It would have been very problematic on *Titanic,* though, since we were going for a very deep-focus style, as we had done on *True Lies*.

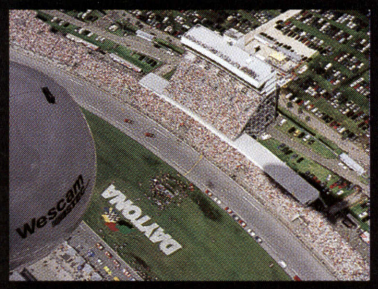
In Super 35, you're able to shoot with shorter focal lengths, you're using spherical lenses, you don't have the strange anamorphic aberrations while shooting, and you're able to get a beautiful anamorphic print at the final print stage. That all speaks in favor of the format. But even if all of those factors combined were a wash, there is still one compelling reason to shoot in Super 35. If you use anamorphic, you cannot do any vertical repositioning whatsoever, so when you go to video you're throwing away half of your beautiful movie. About 99 percent of the video audience will see the film pan-and-scanned. Which half of the picture — the left or the right — don't you want the audience to see?

As for other proponents of the format, John Alcott started it, and he wasn't exactly chopped liver. Plus, he started using Super 35 when the stocks were *not* in his favor and the methodology had not been worked out.

This will be your first film to feature a Panavision logo in the end credits. How did you come to use their equipment on *Titanic*?

Cameron: We didn't obviously shoot *in* Panavision, but they did supply us with equipment and they did built our special cameras [for the deep-water dives], with the help of my brother Mike. I have to say that dealing with them was a great experience. Their technical support was incredible. As you know, we wound down my old

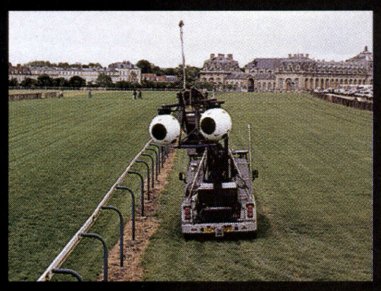








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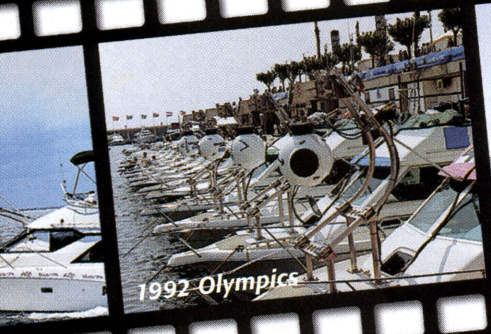






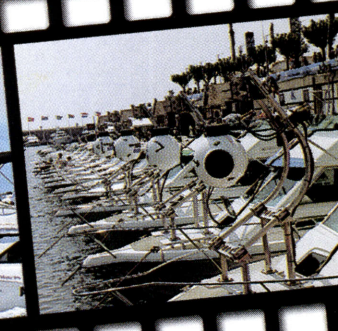


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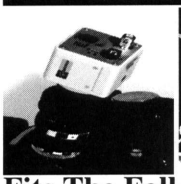
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company, Lightstorm Technologies, and Mike and I entered an agreement with Panavision to co-develop technology. We're going into production soon on a couple things we've designed, including the Vid Stick. So we're in a close relationship with Panavision.

They built a new two-perf 35mm camera for the deep-dives, and a housing that could withstand 6,500 psi. The front glass on the housing had 1.2 million pounds of pressure on it. It was three inches thick and made of special-grind borosilicate glass. The optics between this and the 14.5mm Panavision prime that went behind it were very exacting, and had to be worked out on a computer.

The Panavision FTZSAC camera-control had to be modified so it could be interfaced with the sub electronics to run into the housing and operate the run, frame rate, the iris and the focus.

I also told Mike that I wanted the camera movement to operate with wheels, rather than some joystick control. I wanted smooth, movie-type moves, not joystick scientific movements. To do that, Panavision essentially built a hothead that would function 2 ½ miles under water. It was a big servo-actuated monster that could take this 190-pound camera and housing and move it.

When you're engineering this kind of equipment, it all has to undergo a separate engineering review by at least two other companies, because it's going to be mounted on a manned submersible. The implodable volume of the camera and housing was great enough that if it failed, the shockwave could sympathetically fail the manned sphere of the sub. If that happened, anyone inside would die in about two microseconds. That means your camera and housing engineering is directly related to your life expectancy. It was unbelievably complex.

Another thing Mike and Panavision came up with was adapting a waveform monitor for exposure control. Basically, the waveform monitor shows you where your peaks and black pedestal are. I've sat in enough telecine bays to know that I could look at the video tap picture from our camera and relate that image to how it would look on film. So I would look at the monitor and crank my midscale values to a set threshold that Mike had drawn on the picture tube with a grease pencil. That information would then determine our f-stop, and we basically had great dailies. It's no use reading with a spot meter through a nine-inch thick viewport on a moving sub — by the time you get your reading, the shot will be gone. You'll just drift away. We did all of the readings on the fly with our waveform monitor, and it has occurred to me that this setup could be a powerful tool on the set for certain kinds of shooting circumstances. If you can stick an incident meter in front of an actor's face, by all means do that. But if you're dealing with complex moving subjects from a car or helicopter, and you can't get your spot readings fast enough, the waveform monitor could be a valuable tool. I think cinematographers should consider it.

> "I didn't want to have a dramatic difference between the present day and the past; instead, I wanted to create the sense that you had traveled in a time machine and ended up right there in 1912." — James Cameron

My brother Mike's engineering skills and Panavision's optical engineering and manufacturing skills made this all work the first time out — with just two or three months of development. That's a pretty amazing feat.

Did the shooting approach used on the Imax film *Titanica* [see *AC* Jan. 1995] influence your methods on the 'salvage' portion of your film? Both productions used the same Russian subs and research ship to access the wreck.

Cameron: No, our approach was completely different. In fact, I think it was incredibly ballsy of them to do their film the way they did. They fit the Imax camera into

the interior of that sub and used an existing viewing port, which was basically the extent of their engineering. The big advance on that film was the HMI lighting system they brought down. The Russian subs have a tremendous power envelope, about two to three times the battery capacity that American, French or Japanese subs can deliver. We could take these 1200-watt HMIs down there and burn them for hours. They were very focused beams, and the blue frequency light they create goes through water very well.

Will *Titanic* be released in 70mm? Could you outline your experiences with the format?

Cameron: We're negotiating with Paramount on that point right now. Their appetite for 70mm is zero. I think we should go for 70mm prints in 20 to 25 key cities in theaters that deserve it because they kept their equipment in good repair. And we should do it simply because the 70mm prints will look the best. Blowing up to 70mm from a flat negative has been a strange evolutionary process for me. On *Aliens*, the [70mm prints] didn't look quite as good as the 35mm prints, but the sound was much better. On *The Abyss* it was a wash: the 70mm prints were slightly less snappy, although the grain was finer. On *T2* is was an exact wash on picture quality, but the sound quality was fantastic. But in the case of *True Lies*, the 70mm really edged ahead. The 70mm prints are made from the same IN as the 35mm anamorphic prints, but since they don't have that lateral smearing, I think they look pin-sharp. Our first tests on *Titanic* have been dramatic, and I credit it all to the improvements that have been made in the intermediate stocks. The irony, of course, is that just when 70mm prints should be embraced as a great thing, they're being phased out because the new digital sound formats have made the format obsolete from a sound-quality perspective. On certain films, though — and *Titanic* is one of them — 70mm prints should be struck. But I also feel that the 35mm prints will look absolutely beautiful. ◆

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Since the *R.M.S. Titanic*'s fateful maiden voyage in 1912, the legendary vessel has made several noteworthy cinematic crossings, including *Titanic* (1953) and *A Night To Remember* (1958). Wielding every tool in his considerable artistic arsenal, filmmaker James Cameron has now attempted to render the definitive retelling of the tale, in which mankind's hubris collides with the implacable forces of nature.

Cameron is no stranger to epic film journeys, but this time around he set sail with a different special effects skipper. John Bruno, the stalwart visual effects supervisor who had overseen *True Lies* and *The Abyss*, was off directing his own film, *Virus*. In Bruno's absence, the director turned to Rob Legato, who had worked miracles at Cameron's effects house, Digital Domain, to bring *Interview with the Vampire* and *Apollo 13* to vivid life.

"*Titanic* is definitely a film by Jim Cameron," Legato attests. "I haven't worked with anybody else who was so consumed by a project. He pretty much preconceives how things should be [on the screen], and he has the drive to shoot with those ideas in mind. He doesn't just storyboard everything and then shoot the pieces; for Jim, it's a discovery process, almost as if he has a melody in his head. He just keeps going and going until he hits the right notes to create that particular melody. What makes Jim's films so cinematic is the way he combines all of the film disciplines — camera moves, the look of the film, the actors, the music, the sound effects, the editing. He plays all of those notes until he comes up with the feeling he had hoped for. He's an amazing character — the genuine article."

Legato maintains that viewers will find *Titanic* to be very different from Cameron's previous films. According to its special effects supervisor, the picture offers "a beautiful love story" set against the epic drama of the one and only crossing of the "indomitable" ocean liner. "*Titanic* doesn't really become reminiscent of a Jim Cameron film until the ship sinks," Legato says. "At that point in the story, you get to be on the ship as it's sinking, as opposed to watching it happen from a distance. Jim definitely puts you there. This show was an epic production, undoubtedly the hardest one I'll ever work on."

Cameron and Legato began their collaboration by exploring the entire cinematic history of ship sinkings, as well as the short list of *Titanic* films. In their quest to create the ultimate maritime disas-



Photos by Eric Nash and Virgil Mirano, courtesy of Digital Domain.

Epic Effects Christen *Titanic*

Digital Domain confronts one of film history's most challenging special effects extravaganzas.

by Ron Magid

ter picture, the duo sought to build on the strengths and avoid the weaknesses of previous screen ventures. "Most of the miniature shots involved a model ship on a slow-motion ocean, which looks kind of funky," Legato says. "Miniature vessels have traditionally been populated by stationary figures, tiny puppets, or in extreme circumstances [e.g. *Raise the Titanic*], live hamsters in bonnets. Those types of shots are typically fairly wide, with limited angles, and you never see the multitudes of people on deck. We wanted our shots to look a bit more sophisticated."

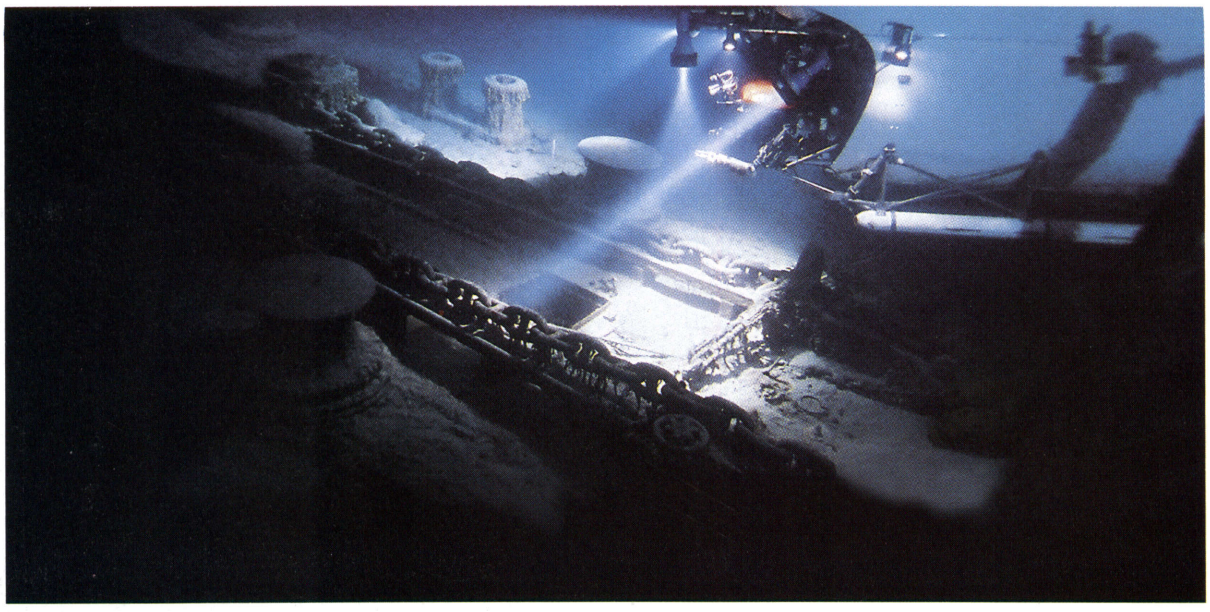
Cameron posed a pointed question: how would such shots be done if the filmmakers had no limitations? Legato's answer was surprisingly simple, but technically daunting. "You'd do a helicopter move along the ship, like we've all seen in cruise-ship commercials," Legato states. "On a film of this magnitude, the unwritten rule is generally to shoot it in a way that has never been seen before. Our philosophy on *Titanic* was just the opposite. We're all familiar with those helicopter shots; in and of themselves, those types of images are not startling, because that's what you'd do if it were real. Jim wanted to sell the audience the illusion of how great it would be to take a trip on the *Titanic*, so we decided to basically make a commercial for the ship."

Cameron's decision to shoot the *Titanic* "for real" dictated the entire technical approach to the film. The filmmaker's strategy is best illustrated by the shot in question: a dramatic fly-by that soars along the ship's entire length. Legato explains, "We needed to create a synthetic ocean plate, and put people on the ship — walking, talking and behaving naturally during this huge helicopter move as the ship is underway. There's no such thing as a motion-control helicopter, and we couldn't shoot motion control on people that high up. To do that, we'd have needed a rig that was 100' in the air and could traverse the entire 900' length of the ship. That was obviously impossible, so we started asking ourselves, 'What is achievable?'"

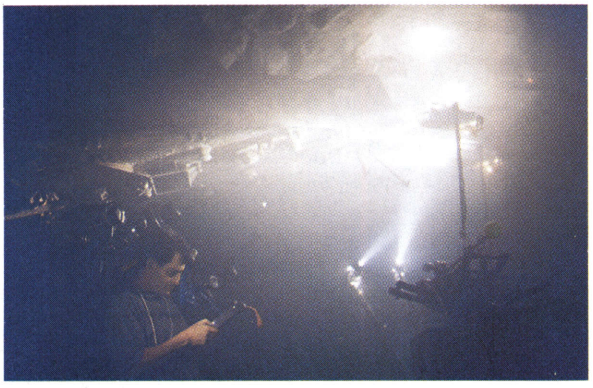
The die was soon cast. Legato recalls, "Jim made the commitment that we were going to explore certain options, and therefore simply 'force into existence' the tools we needed to achieve them — knowing that once we forced those tools into existence, they would change the way films were made. We began exploring computer-generated water, and evaluating motion capture to see if we could use it to create real vignettes of people shaking hands, strolling on deck, sitting in chairs, standing at the railing — all of the stuff you would expect to see in a cruise-line commercial. In the end, we felt that motion capture would deliver that for us; once the necessary data was in the computer, Jim could direct where the people walked, and I could photograph them from any camera angle. One of the good things about Jim is that after we proved that motion capture could work, he had the vision to say, 'Yes, I agree with that' and then do it."

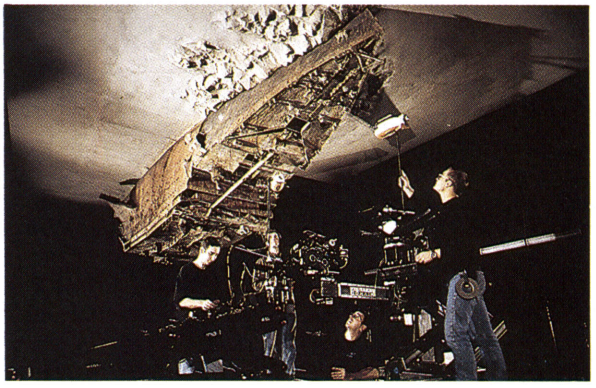
3-D digital effects supervisor Mark Lassoff, co-supervisor Judith Crow and a team of 30 were responsible for creating the unique human figures populating the *Titanic*'s decks. As Cameron planned epic shots sweeping down the glorious length of the ocean liner, Lassoff and Legato selected countless DD employees to go down with the ship. "People who moved well and showed that they could be directed ended up being on board," Legato says. "And you could really pick them out in the finished scenes: the [digital figures] moved like the people we chose. Motion capture shouldn't terrify

The* Titanic *departs from Southhampton, England en route to Cherbourg, France to pick up another group of doomed passengers. Cameron's desire to photograph the ship "real for real" led to the use of both the near-full-size ship set at Fox Baja Studios and a 45'-long* Titanic *model for this sequence. CG passengers, based on motion-capture performances, were added to the decks of the miniature.



Submersibles explore the rusting wreck of the great ship. Miniature work done at Digital Domain had to perfectly match footage shot by Cameron during a dozen real-life dives. The scale-model wreck was mounted from the ceiling to allow the subs and camera to be operated via an "inverse gantry" motion-control system mounted on the studio floor.





actors, because it won't replace them. We discovered that we really needed actors to create the performances and do things that were dramatic. Even though we were doing something impossible with the camera, it was still no different than having those people actually perform the various actions."

Still, *Titanic*'s decks had to teem with thousands of these CG extras. The solution: cloning. "We built a library of people, composed of various portions and movements, which we mixed and matched and altered to make endless walk cycles," Legato relates. "At a distance, there are certain details you can't make out, so we used a lot of the same people — wearing different-colored costumes, and appearing in sunlight or in shadow — just to create the impression that these were real moving people. Fortunately, we didn't have to create computer-generated costumes; we could just generate shells, apply a texture map of real fabric or real costumes that had been photographed conventionally, and then light each figure individually.

"Pretty soon, we found ourselves creating the sense of actual people, and some of the shots we did were alarmingly real. They didn't look computer-generated, because they were patterned on real people and real performances. Certain motions were not 100 percent there in absolute close-up, but our approach really paid off once we shrunk our motion-capture people to the proper sizes and stuck them on the ship. At that point, they started to develop some soul, and to look like real people. If you'll pardon the expression, we've only exposed the tip of the iceberg with this technology. As we get better with the technology, a scene like this will become more and more convincing, until it's just another shot in the movie."

Hewing to the concept of shooting the *Titanic* for real, Cameron began filming a number of sequences on full-scale replicas of the ship's midsection (extending from the captain's quarters to the end of the promenade deck) and poop deck. Both of these structures were built in a huge water tank on Rosarita Beach in Baja, just south of the Mexican border. As shooting progressed, Cameron wanted to see more and more of the *Titanic;* the poop deck was soon connected to the rest of the ship, which had been extended to the tip of the bow. When all was said and done, Cameron had built virtually 90 percent of the *Titanic*. "All that was missing was a 40' section from the absolute tip of the bow to the well deck, where the mast was," Legato recalls. "That was taken out for technical reasons — the tank was only so big. It was a huge logistical nightmare to work with a giant ship in a giant tank filled with



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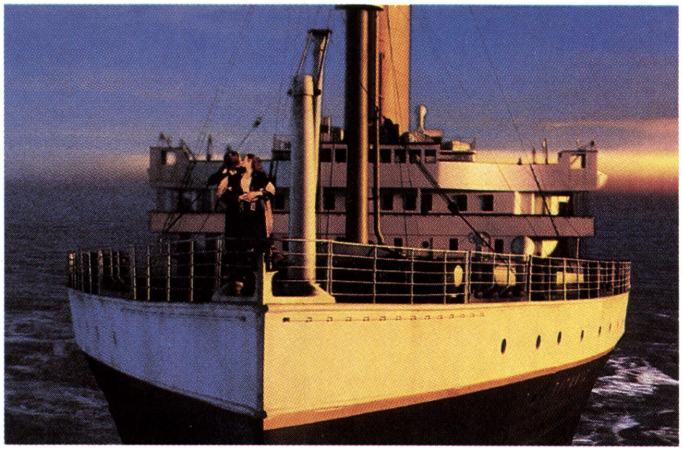
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Right: ***Cameron directs Leonardo DiCaprio and Kate Winslet. The couple was later composited into a long helicopter-style shot ending in a medium close-up of them standing at the bow of the ship (far right).***
Bottom: ***Visual effects supervisor Rob Legato (left) and director of photography Russell Carpenter, ASC discuss lighting on the greenscreen stage.***



water; the only way the crew could drive the big cranes carrying the cameras and lights through was to make a hole in the boat."

Back at DD, 3-D digital effects supervisor Judith Crow (*T2 3-D*) was building on the work she and Legato had begun on *Apollo 13*, spearheading the development of a Prisms software pipeline that would allow the effects team to plan each shot and keep track of various elements as they passed from artist to artist. "Prisms is the program of choice for quickly setting up a scene and determining what all of the issues are going to be," Crow says. "We organized all of the data in Prisms first, then jobbed the work out to DD artists, using every software package we could get our hands on. We R&D'd many things we hadn't done before on *Apollo*, but there was nothing that felt impossible. There was a scarier edge to the work we did on *Titanic*, though. We had to develop a few things on this show which, once we started, we didn't know if we could make work."

Crow's 3-D digital artists did a great deal of R&D on new processes for tracking camera moves and reconciling motion-control data. These techniques would help to extend the *Titanic* set and add CG ocean plates to Cameron's inevitably fluid shots. One such development was a system that used stereo photographs of sets to reconstruct

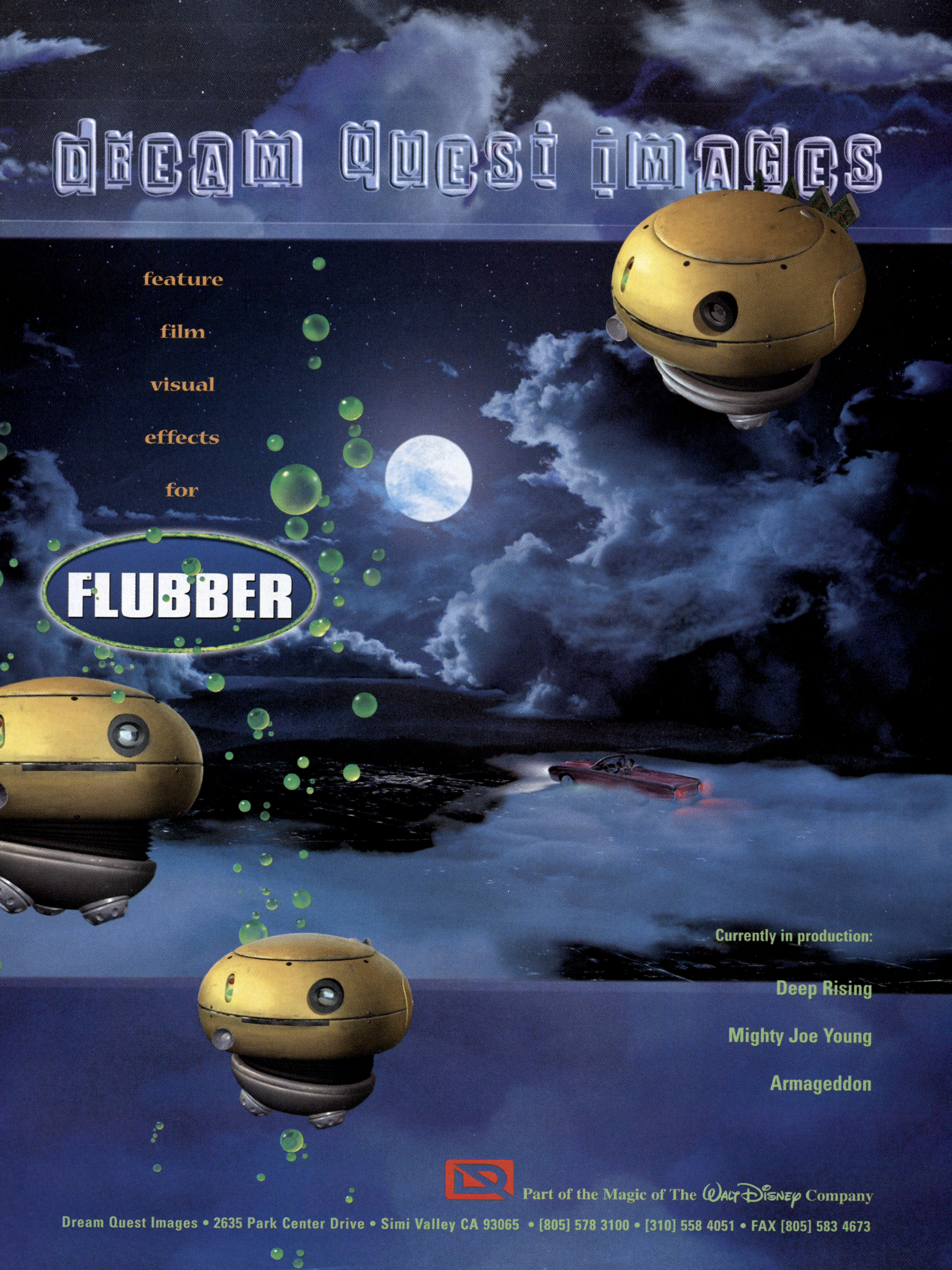


physical environments in the computer. Crow's team used that data to extract camera moves and apply that motion to the CG ship extensions and/or ocean plates. "It's like digital surveying," Crow explains. "By photographing the set with twin cameras mounted a known distance apart from a known angle, we can use software to derive the location of points in three-dimensional space from the features in the photographs. Once we've reconstructed the geometry of the set, we can extract camera moves from it.

"That works for smaller scale, closer shots. For wider shots, we would place a teepee-shaped object in the set, and then take photographs using a handheld camera from two different angles. We could later reconstruct the set from that known geometry. We used these methods for all of the effects shots filmed in Mexico. Any time we had to do a digital extension involving a set with a part missing, we would reconstruct the data to derive the camera moves and the geometry of the set, and then use that information to track our CG ship extensions and water and sky elements onto the full-scale *Titanic*."

After the 3-D digital team diligently added the missing 10 percent to the full-scale *Titanic* set, and placed the landlocked ship in the midst of a highly believable CG ocean, those disparate elements were composited by artists working under 2-D digital effects supervisors Mike Kanfer and Mark Forker, another pair of *Apollo 13* veterans. Cameron and Legato hoped that by keeping DD's *Apollo* team together, shots of the doomed *Titanic* set against the immensity of the sea would achieve the same majesty and mythic power as shots of the Apollo capsule lost in the vastness of space. "The *Titanic* is a major star of the film," Legato says emphatically. "It's treated lovingly, and is pampered in the way it's photographed. When we put the *Titanic* miniature into our background re-creation of the Southhampton dock, our concept was to make the buildings smaller and the other boats in the harbor less attractive. We treated the *Titanic* as if she was a female movie star: you don't surround her with other beautiful women, you make her the focal point. The *Titanic* is the star of any one shot. We're in awe of this ship."

Consequently, visual ef-


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Adding Depth and Breath to *Titanic*

VIFX jumps aboard project to add convincing details.

When it became clear that Digital Domain could not handle the entire effects load for *Titanic*, some 150 shots were farmed out to VIFX (*Speed, The Relic,* the upcoming *X-Files* movie). The company's duties included putting full-scale people into two different miniature engine-room environments, and adding starry skies and visible breath trails to shots of actors going down with the ship.

For the engine-room sequence, VIFX composited live-action actors shot against greenscreen into the real engine room of a working Liberty ship, which Vision Crew Unlimited had transformed into a ⅓-scale miniature of the *Titanic*'s engine room (see accompanying story on p. 81). "The Liberty ship was a real ship whose engine type was similar to that of the *Titanic*," explains VIFX founder Richard Hollander. "But its engine room wasn't the right size, so we added people in the appropriate scale to make it look huge. The issue was getting the interactive lighting to look right. The second-unit director, Steve Quale, was a great help in doing that. The hard part was putting in steam and getting the composites to layer in perfectly."

The ⅓-scale "miniature" made these shots relatively easy to believe. The challenge for VIFX was to intercut its elements with shots of a separate 1/14.7-scale miniature supplied by DD and photographed on VIFX's motion-control stage. "The 1/14.7-scale miniature was tremendously small for the work we were doing, which involved a ton of lights," Hollander remembers. "We would rather have had a 1/6-scale model. The miniature wasn't quite done, so we also put a lot of detail on those portions that were going to be in close-up, because we planned to get within inches. We wanted to mimic the kind of lighting that would be in there for real — a bunch of incandescent bulbs, rather a large ambient fluorescent fill — so we used very little fluorescent lighting. The caged lights in the set were one layer of lighting, but the majority of light came from a fairly accurate representation of the overall style of the lighting, if not the position. We literally hid bulbs all over the place to create that look. There were hundreds of lights hidden behind pillars, behind major struts and peeking in from the sides. We did several motion-control passes on every shot: a hero, a smoke pass, an incandescent light pass, and a series of four or five different matte passes."

Hollander set up another stage where the VIFX crew could shoot extras on the ground floor and on platforms and catwalks against greenscreen. These people were later composited into the appropriate areas on the miniature set. "We shot a lot of elements. We composited anywhere from two to seven people in any given engine-room shot."

One of the more difficult shots involved a simple boom down from the upper portion of the engine room to the ground floor, moving past people on catwalks and toward the workers below. "We started off by doing a camera move on the miniature until Cameron liked it, but we ran into trouble when we expanded that motion-control camera move out to full scale," Hollander says. "I didn't have enough depth in my stage to complete the move, so I rescaled the shot. Since the floor was the controlling constraint, I scaled my move to it and decided to make everything smaller as we reached the bottom. We even hired shorter actors so that they were scaled properly to the move. There still wasn't enough space to shoot the full-scale and scaled-down moves in-camera

Continued on page 70

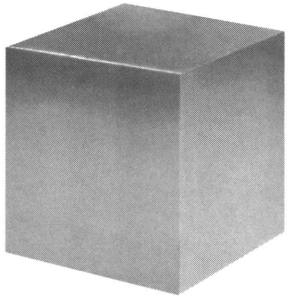
fects cinematographer Eric Nash, yet another *Apollo 13* alumnus, employed some striking beauty lighting on the *Titanic* miniature, particularly for earlier scenes of the majestic vessel in motion. At 45' long, DD's *Titanic* model was bigger than some real boats, which created a number of photographic challenges. Nash allows, "The bigger the miniature, the more it alleviates depth-of-field problems, but the downside is lighting them, especially in a space that really isn't big enough. That was one of the things we struggled with from the outset on the 45-footer. As soon as we put that 45' ship in that big hangar at the Hughes Aircraft site in Venice, and tried to put our keylight far enough away that it looked even and the shadows fell naturally, we quickly ran up against the ceiling or the wall. In the confined spaces we had, it was next to impossible to light the *Titanic* evenly, so we used multiple keylights for practical and aesthetic reasons. Cameron wanted to play up the majesty of what was, at the time, the biggest, grandest ocean liner in the world. We were creating a kind of ode to the *Titanic*.

"Since the ship was the lead character in the movie, it had to look better than it really would have looked in single-key daylight, so we took some license. For example, the foredeck looked best when it was sidelit with long raking shadows falling across it. If we applied that same direction of keylight to the funnels, though, they looked flat and uninteresting, so for those we cheated the keylight more around the back. Tony Anderson, my gaffer on the big ship, came up with some clever ways of making three 18K HMIs look like one keylight. We tried to do it judiciously, but there's no shot with a single keylight where you see a significant amount of the ship. I'll be the first to admit that anyone with any kind of an eye for lighting will be able to tell that the *Titanic*'s miraculously lit from two or more positions. But during the flow of the scene, I don't think most people will notice."

Nash shot the 45' *Titanic* using four-perf Mitchell cameras rolling in Cameron's preferred Su-

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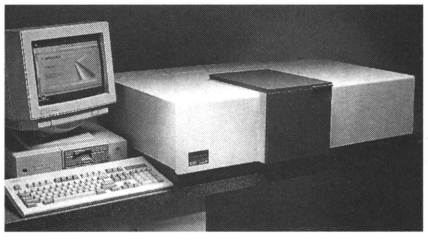
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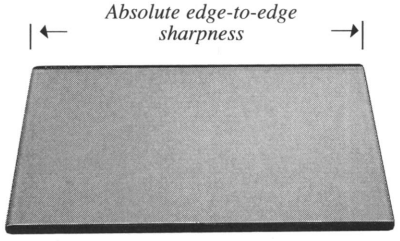


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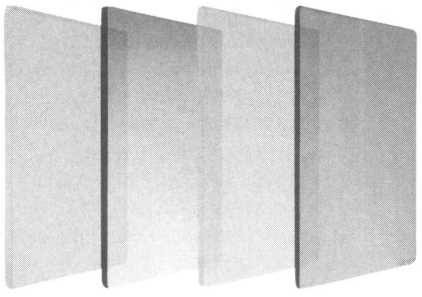
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simultaneously, though. In the end, I did the move on the 100-percent scale people from above, then just scaled that move down on our motion-control camera system and shot the lower part with the smaller actors. It wasn't forced-perspective; it was forced-scale or pseudo-scale. In a forced-perspective shot, you're fiddling with the lines of perspective, but here, our perspective was true. We just made everything a little smaller.

"Our CG supervisor for that section, Edwin Rivera, then composited three scales to make those shots look like one continuous move: the live-action scale for the upper section, the 1/14.7-miniature scale, and the .8 live-action scale for the bottom layer. I'm very proud of the complication, which made it very believable. The net effect is a humongous engine room with all of these people running around on catwalks and on the ground."

For *Titanic*'s climax, VIFX added stars to the night skies behind the sinking ship. "Stars are miserable to do," Hollander observes. "Jim used a lot of handheld camerawork, so there was anywhere from one to three layers of affective motion in these shots, and we had to change the direction of the stars to match. We had to track the handheld movement and then layer in the effect of boat motion, so the stars would be moving and rotating [subtly and in sync]. After we dealt with the technical layer, Jim had an artistic vision, which we had to add on top of that. The stars are not vivid. The action in the movie is not about stars, it's about these two characters careening in the water. Those are the rules. The complexity of those shots — the delicateness of the stars and the actual dynamics of how they move behind the characters — is amazing."

Aiding in this effort was Silicon Grail's Chalice 2-D compositing software, the new version of which offers garbage matting and motion blur, as well as a procedural paradigm that speeds such extensive compositing work.

VIFX faced another challenge in trying to create icy breath trails that would emanate from actors' mouths, simulating the extreme cold that plagued the disaster's victims during *Titanic*'s final hours. "We were shown these incredible close-ups of Kate Winslet and Leonard DiCaprio in the water, plus shots of other actors on the boat as it's sinking," Hollander recalls. "Cameron wanted to see light playing off their breath. Some people suggested using cigarette smoke, but I said 'No way.' I chose not to do it in CG either, because we didn't have enough time to develop the look.

"Instead, we built a cold room and shot real breath emanating from a real person surrounded by black velvet. It was a cheaper methodology. We had a light up above and we shot the breath from various positions; the breath became the only visible detail over the black velvet."

Hollander's team soon discovered there were other complex chores to tackle — such as synching the breath to the actors' dialogue. "We actually tried having the 'breath people' say the dialogue, but that usually was not the best way to do it. Breath stutters; it's staccato, and it has different rhythms and volumes. In the end, we basically built a huge library of breath, and asked the animators to listen to the dialogue and add the breath in time with the actors' voices. That's what we did for a hundred shots, and we found out that it's not easy to do; it takes great skill and great trickery to make it look right. My CG supervisor for that stuff was Cheryl Budget, who managed a massive amount of work."

Unlike some others who have worked with Cameron, Hollander found that the director's exactitude made his own work easier: "The role for me on this show was not to be creative and come up with a million different ideas. Jim pretty much knows what he wants, and if you listen to him, you just converge on a solution. Once you get into that mode, it's fun. I wish all of my projects were like this." — Ron Magid

per 35 format. Night scenes were shot on Kodak's Vision 500T 5279 stock, while daylight scenes were shot on EXR 5245, "because that's what the first unit was using," Nash says. "5245 is a [50 ASA] daylight stock, so it's very slow — which, combined with the small aperture we were using for depth of field, stretched our shooting times into hours, especially when we did close-ups. There are some shots where we are way closer to this miniature than anybody in their right mind would get, but Cameron likes to push the envelope."

The director had decided that the full-scale *Titanic* would be employed mostly in tight shots of people on deck, while a miniature would be used for longer shots of the entire ship underway. "The full-scale set was designed to be used for shots looking across the deck, toward the real ocean behind the ship," says Legato. "We even used camera moves to suggest that the *Titanic* was actually underway, not just sitting on a beach against a stationary background, which was a very effective tactic."

Meanwhile, Cameron mandated that Legato and Nash devise elaborate means to put his human stars on the deck of the 45' miniature. "Jim thought it would be cool to start on a close-up of Leonardo DiCaprio at the bow, and then go back the entire length of this 900' ship to show that it's basically teeming with life — a thousand people walking and talking, guys in steerage having a fistfight, parents picking up their children and pointing out how big the smokestacks are," Legato says. "This is the glory moment, but it also sets up the rest of the story."

During the sequence, the camera begins on a two-shot of protagonist Jack Dawson (DiCaprio) and his shipmate, Fabrizio (Danny Nucci), standing on the bow and the camera circles around them to the starboard side, pulling back along the *Titanic*'s entire length in one continuous helicopter-type move. The shot rises up over the bridge, past two of the funnels, then crosses back to the port side, dropping down almost to the waterline before ending on a

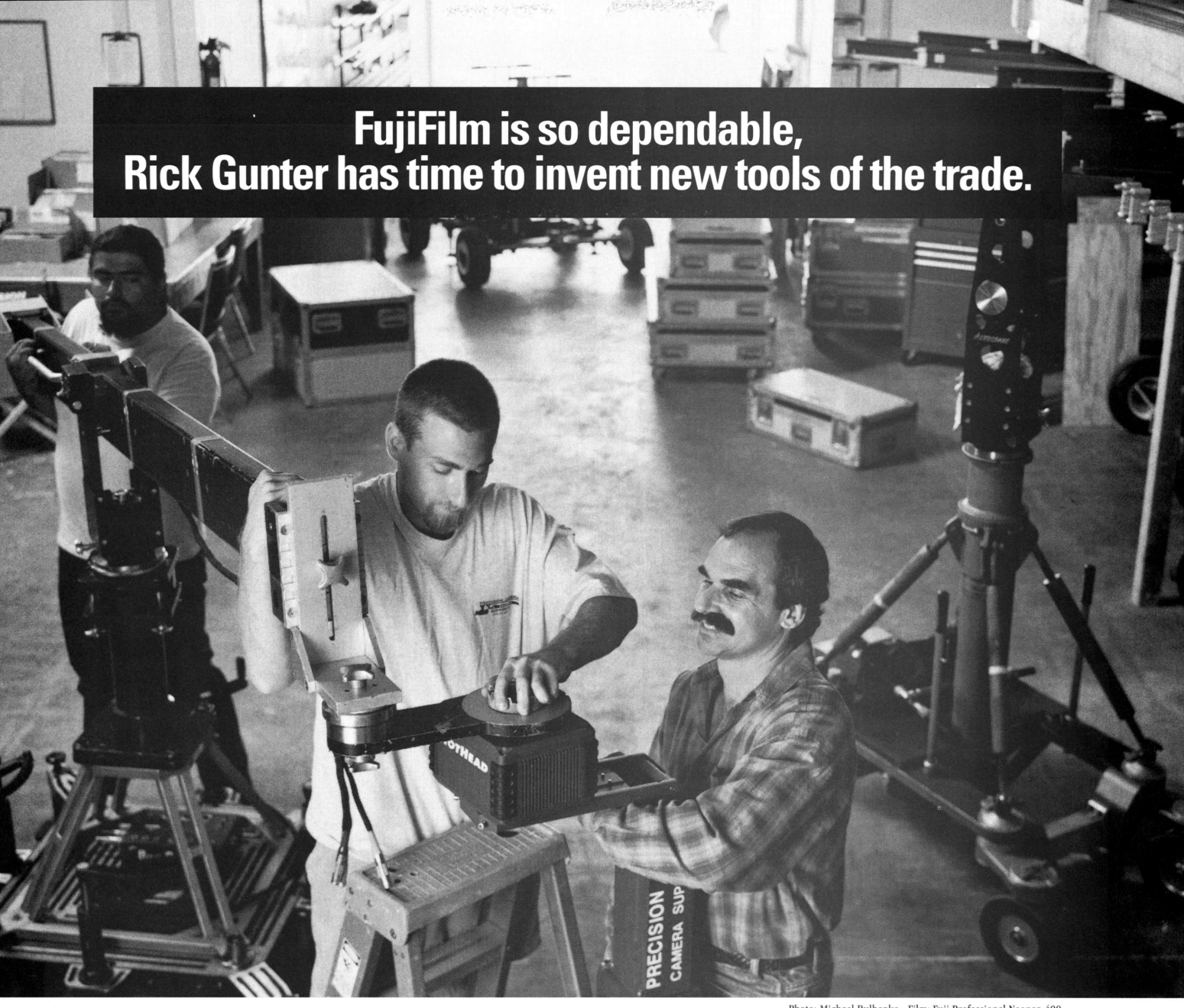


Photo: Michael Bulbenko. Film: Fuji Professional Neopan 400.

Most people like to get away from work now and then. Director of Photography Rick Gunter spends his off-hours outside the "Beverly Hills 90210" set developing new tools for...the set. What started as a hobby for the second-generation DP has become a successful business. Gunter, his son Brian, and key grip partners in Precision Camera Supports, use their knowledge as working pros to dream up more efficient camera supports, car mounts, and grip stands.

Their latest product: a new tracking system for remote heads that will be easier and less costly to operate. "It's all fun," says Gunter. It's also about having the best tools.

For this DP, that includes FujiFilm. In night shots, by firelight, on a high-contrast beach, "Fuji comes through," Gunter says. "It maintains details and looks wonderful." And because it's so consistent, he doesn't have to waste time worrying about performance. Weekends he can stay home — and draft ideas on how to make things work better.

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Captain E. J. Smith (Bernard Hill) peers out at the horizon; the skipper was to retire soon after the Titanic's crossing of the Atlantic. Various ship miniatures were utilized for such wide vistas, while the full-size ship set was primarily used for medium and close-up shots. 5245 was generally used for such effects work to match the look established by the main unit.

distant view of the liner leaving the European continent forever. In tackling this sweeping move, Nash decided to shoot the miniature first — once he figured out how to do it. "Part of the problem was where to lay the motion-control track, and how to configure it on stage so we could hit all of these key frames along the way that Jim felt were really important," Nash recalls. "In the end, we put the camera on a crane-arm motion-control system. It was a fairly involved process just programming the shot and getting it to have that smooth helicopter feel. It's the first time you get a really good look at the whole ship both in close-up and in long shot."

As far as Nash was concerned, the camera position at the start of the move came "ridiculously close to the model, but after we shot a test, Cameron said, 'Get closer!' Our model crew chief, George Stevens, and his team did their finest paint job. They begged us not to get any closer, but the model held up amazingly well."

The finished shot — which was later optically flopped — was over 1,000 frames long. "We couldn't even shoot the beauty pass in one piece because it required different lighting and flagging setups for different portions," Nash says. "We actually had two shifts shooting that shot, and we had to choreograph overlaps as we transitioned from one setup to the next, being very careful about shadows not changing and flags not crossing. Once it was programmed and approved, it took 60 hours of continuous shooting from the time we started rolling the first pass till we were finished — 2 ½ days, with a 10-man crew at all times. No individual pass lasted more than a couple of hours, and most of the work was changing setups and mattes. When it was all said and done, they had to scan 9,000 frames of film for all of the various pieces — and that was just the miniature portion."

Nash then had to come up with a way to shoot the talent and lock them onto the bow of the ship during this incredibly intricate continuous shot. "That was one of the big challenges that Rob hit me with early on," Nash admits. "I said, 'How are we gonna do that, Rob?' and he said, 'Oh, you'll figure it out.' He had a broad idea about doing something we played with when we were both working on *Star Trek: The Next Generation*, using rotation in the subject to replace a big translational camera move. The problem Rob laid on me was to figure out the math to translate this huge sweeping motion-control helicopter move into something that we could shoot full-scale on the talent in real time — knowing that there wasn't a motion-control machine in the world that could do this move as it was done on the miniature, at full size and 24 frames per second."

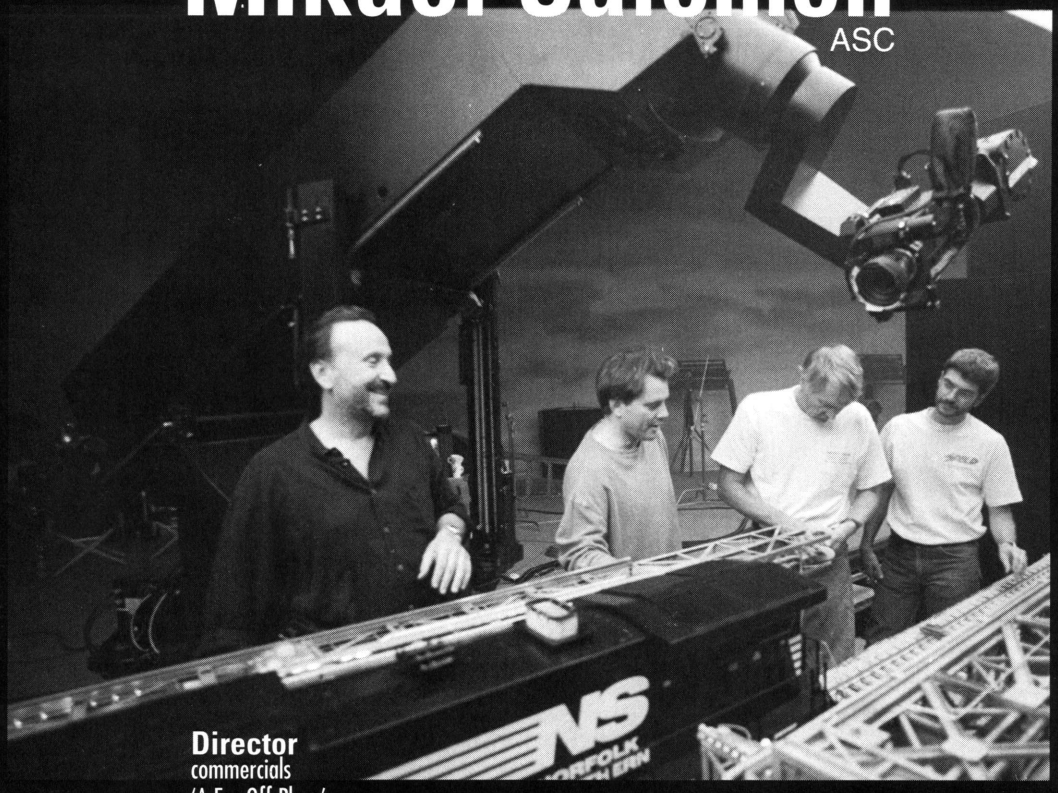
DD didn't even have a fast, steady real-time motion-control rig, so Nash worked out the broad strokes of the design, then asked Scott Salsa, who heads DD's machine shop, to engineer it. In order to scale up those sweeping motion-control "helicopter" moves on the 45' *Titanic* miniature, Salsa's real-time equipment had to move very quickly. "This thing had to scream up and down the track, sometimes moving 10 feet per second, and be steady as a rock," Nash says. "Otherwise, we couldn't have pulled this shot off. Scott's rig worked like a champ."

Using Kuper motion-control software, which has "an incredible array of tools that we can trick into doing just about anything," Nash figured out the rotation of the camera around a point on the bow, and then applied that circling motion to a revolving green turntable, where DiCaprio and Nucci stood at a green railing (built to match the miniature *Titanic*'s bow) against greenscreen. "Once I figured out the geometry of it, it only took a trivial conversion of the east-west and north-south motion-control data to convert it into a north-south camera move. Then I extracted the big east-west move going around them, and translated that into the movement of the turntable. When we shot the live-action part, we used the miniature shot as a playback source on-set so we could preview the composite and see how the actors were sticking to the ship. It worked remarkably well. There's going to be a little bit of 2-D reconciliation in terms of really nailing their feet to the deck, but it was incredibly close."

There was still one more challenge to overcome before Cameron, Legato and Nash could convince audiences that DiCaprio and Nucci were actually standing on the bow of that miniature boat: lighting the actors on the rotating turntable. "They weren't supposed to be rotating relative to the world that they were in," Nash explains, "so we had to rotate the keylight with them. We hung the keylight on this horizontal arm connected to this big dinosaur vertical tower mounted on the actors' turntable."

Nash ended up shooting five of these elaborate motion-control greenscreen setups to put the talent on the miniature *Titanic*'s

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" On this particular shoot we didn't have the time or money to build all the train carriages required or to motorize the train track. Our solution was to shoot the two carriages we had in different positions and at different speeds to simulate a very long train and train movement on film.

Including the mattes, we shot a total of 65 passes which composited together well due to the excellent repeatability of the Milo system."



The soft and beatific photographic style established by Carpenter was carefully maintained by effects cinematographer Eric Nash while lighting the miniature interior sets at Digital Domain. Such sets were constructed on gimbals to allow angles to be adjusted for "sinking" scenes.

deck throughout the film. The trickiest of these was a much shorter shot in which the camera rose steeply away from DiCaprio and Nucci on the bow. "It was not nearly as big a shot, but it had way more rise than I could do practically," Nash recalls. "When I shot the original moves on the miniature, I knew we'd have problems down the road shooting people to match into it, but I didn't want to tone the shot down. To shoot the live-action part, we needed to do 20' crane-arm shots, but the real-time motion-control rig we built didn't have nearly that much range. The only solution we could come up with was to put the motion-control rig way up in the air on a 60'-long, 13'-high platform and get what we could with the camera, while having the talent ride on a north-south motion-control elevator which was also on motion-control track. We took the arm of one of our motion-control rigs, built a platform on it, and basically made a rotating motion-control elevator out of it. In order to shoot this, we had some bizarre choreography involving our motion-control camera screaming down the track and craning down, with the talent rising up and rotating on a turntable coming toward camera. When we watched the shot on the videotap, it just looked like two guys against green with this stage racing by, like 'What is going on here?' But when we laid it on top of the ship, there they were standing at the bow as this big helicopter move happened. It was pretty amazing."

Framing the epic story of the *Titanic*'s infamous journey is a "documentary" account of a salvage dive to the decomposing wreck by two small *Mir* submarines nearly 85 years later. DreamQuest Images had achieved similar shots of several mini-subs gliding over a sunken nuclear submarine for Cameron's previous



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underwater effort, *The Abyss;* the company's team had captured the scenes by constructing an overhead motion-control gantry, which simultaneously flew the multiple mini-sub models (mounted on wires) through the smoke-filled, dry-for-wet environment toward the downed sub set, anchored to the floor. Those shots were achieved almost entirely in-camera, which created a very believable scenario in which the mini-subs cast interactive lighting and shadows on the sunken sub set and each other.

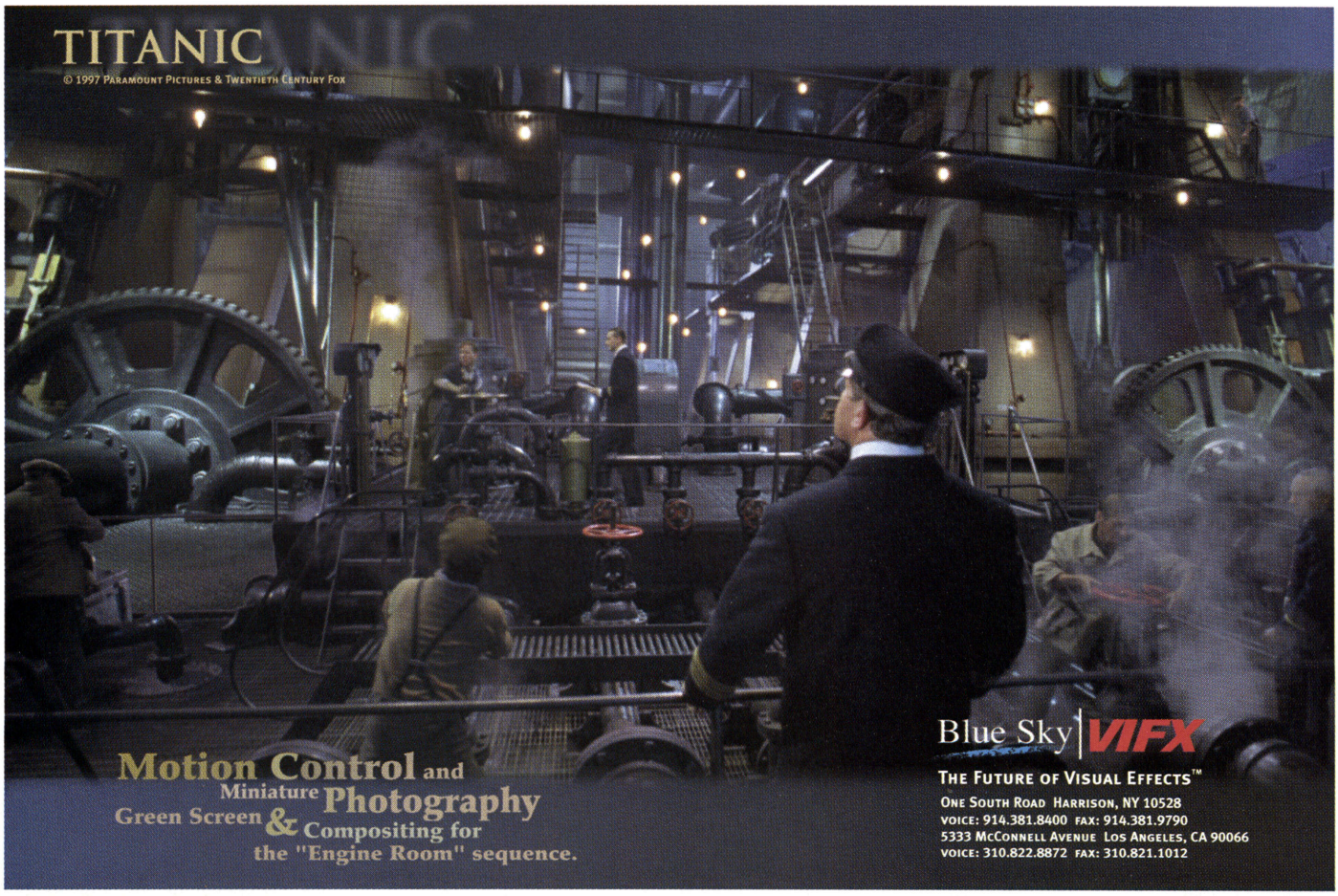
On *Titanic,* Legato didn't have enough time and money to build a gantry, or the inclination to fly *Mir* subs on wires, which would have made lighting difficult and control even more so. Still, he liked the in-camera quality of DreamQuest's approach. His solution was elegant, simple and cost-effective. "Rob said, 'What if we just hang the shipwreck from the ceiling? Then we could do everything else on the ground, and we wouldn't have to hang the subs from wires,'" Nash recalls. That way, the model-moving rigs could be used for other applications afterwards.

Legato's "inverse gantry" was set up in another part of the same Hughes Aircraft hangar where the 45' *Titanic* was shot. The detailed 1/20-scale shipwreck miniature was hung upside-down from the hangar's ceiling, while the 1/20-scale *Mir* subs, built by Tony Meininger, were also mounted upside-down on two model-movers running along track on the stage floor. To program the moves of the *Mir* subs and the camera, which was itself mounted upside-down on a third grounded model-mover, Jim Rider, *Titanic*'s dry-for-wet motion-control operator, juggled 24 axes of motion (eight for each mover). The models and camera, working in close proximity, were constantly in danger of running into each other in the dark, smoke-filled stage. And with the shipwreck, subs and camera upside-down, Nash and company had to constantly be thinking in reverse.

Sometimes, the hangar itself created problems. The tin structure tended to "breathe," causing the shipwreck model to "sway in the breeze," according to Nash. "Nothing gives a shot away quicker than seeing this wreck that's supposedly planted on the ocean floor moving in front of camera, so we braced the model off to the floor with steel pipe to keep it from swinging."

To make matters worse, the spotlights on the mini-subs, actually focusable Mini Mag-Lite flashlight bulbs and reflectors, were relatively dim; consequently, exposure times routinely stretched to 30 seconds per frame, which meant that some passes took six hours to shoot. Unfortunately, the bulbs weren't designed to run continuously for six hours in smoke, and they would often go out in the midst of the long passes. "Depending on the situation," Nash recalls with a sigh, "we'd either replace all of the bulbs and start over, or back up a few frames, replace the bulbs and pick it up again, hoping that we wouldn't lose any more of them."

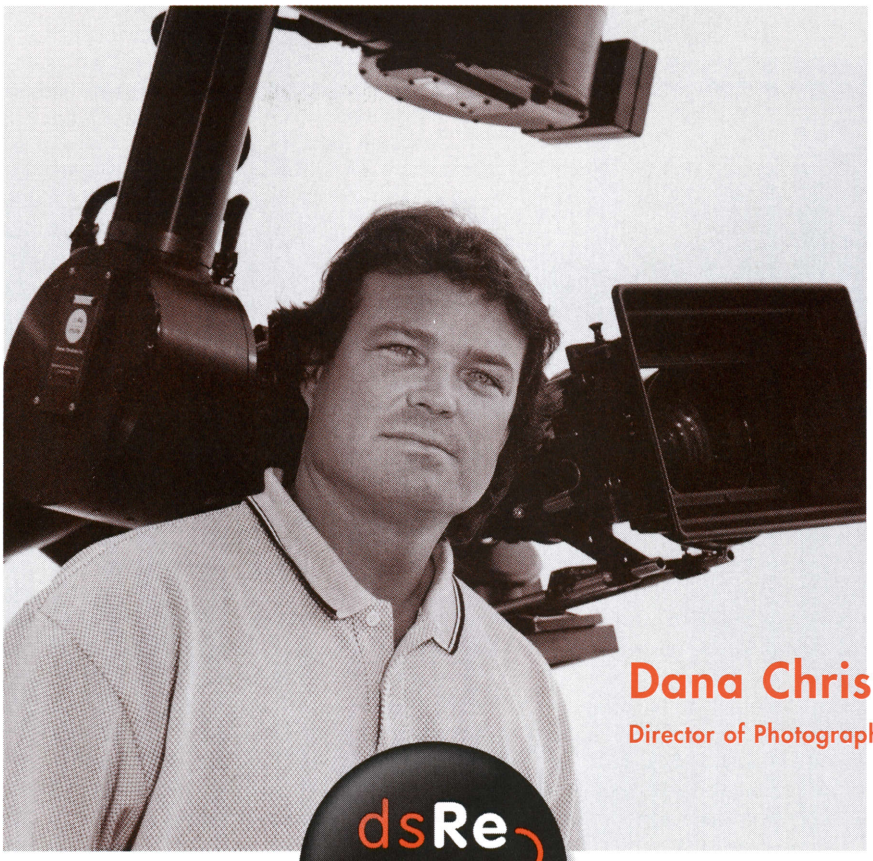
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Throughout this adventure, the dsRemote's feel and responsiveness was excellent. Prior experience with 2 and 3-axis remote heads has taught me to be very concerned with rigidity and dynamic/harmonic vibrations which affect the smoothness of the shot. This head's performance was absolutely solid and yielded one smooth shot after another. Congratulations to Weaver/Steadman!"

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Sailing into infamy. Says Legato, "Jim [Cameron] wanted to sell the audience the illusion of how great it would be to take a trip on the Titanic, so we decided to basically make a commercial for the ship."

sion 500T 5279 stock, which worked so well for the night shots of the 45' *Titanic,* presented problems on the smoke stage. "It's got a few quirks in the blue layer," Nash explains. "There's a magic spot on the curve of the film that gets incredibly grainy at a certain density in the blue layer. Above that it's fine, and below that it's fine. There were so many variables with the dry-for-wet work in terms of smoke density, blue fill and the little sub lights that sometimes, even after we'd done tests and gotten a shot approved, we'd shoot it and it would be grainy beyond belief."

The greatest challenge for the effects team was matching their dry-for-wet shots with 35mm two-perf footage of the actual *Titanic* wreck. Cameron commandeered two *Mir* mini-subs down to the wreck in the summer of 1995, and shot the footage himself. "That real footage is going in the movie," Nash says. "We're just augmenting it. The camera was on one sub, but both subs are in the movie; we're doing all of the shots that feature both subs, as well as the wide shots Jim couldn't get because it was pitch black down there. Because he's using real footage, ours has to match impeccably. He's going to be cutting back to back, so there's nothing to hide behind. It's been a long haul just establishing the methodology."

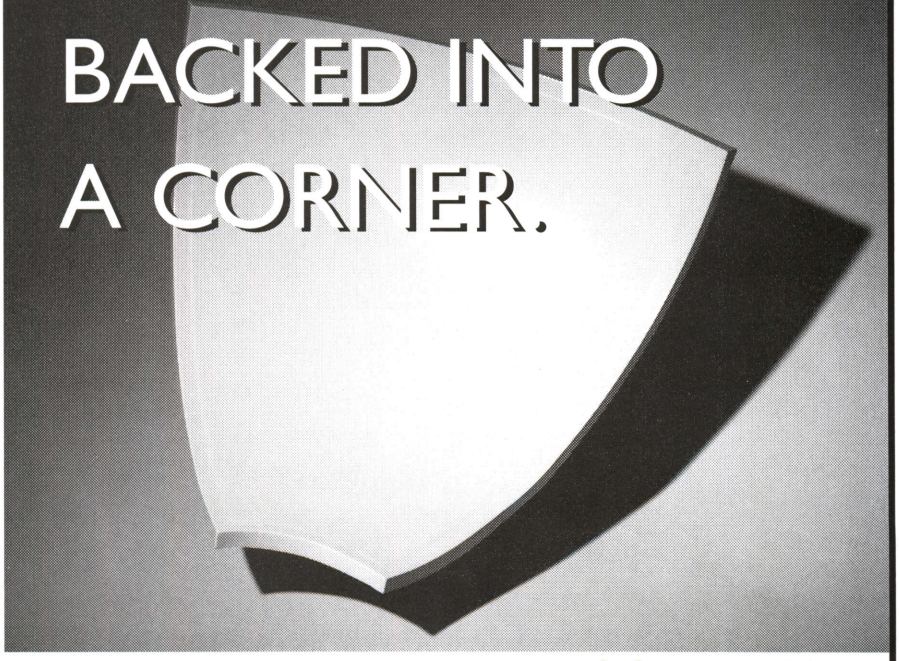
Often, it's the almost invisible details that make for effective effects. After studying Cameron's footage of the actual wreck, Legato realized that the images had a specific blue haze which suggested the immense volume of water; after some tests, he learned that it was impossible to recreate that same look on the dry-for-wet stage with lighting alone. Legato's solution was to flash the film — in-camera, during lengthy motion-control moves. "We did the flash in one light pass on the blue layer of the film," Legato explains. "We used a blue-and green-gelled Kino Flo backlight that was maybe six stops underexposed, so dim

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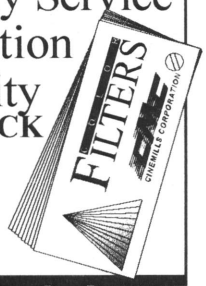
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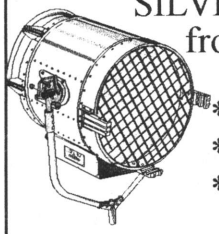
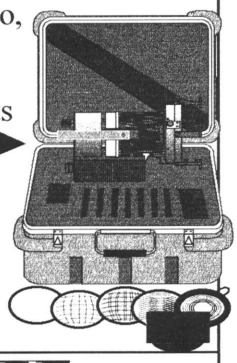
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that it couldn't register on film if photographed separately. Although you couldn't see the flashing itself, it broke the inertia of the film in the blue layer, and with the addition of white light in the foreground, where the mini-subs' lamps were, it was enough exposure to register the blue layer and create the illusion that as the white light falls off in depth, it naturally becomes deep blue. The effect looked perfectly natural and was a dead match to the real underwater footage."

The final shots were achieved almost entirely in-camera. The rods supporting the subs were removed digitally by DD's CG artists, who also added digital particles, only visible in the subs' lights.

Titanic is a memory piece told from the point of view of a wreck, played by actress Gloria Stuart, a veteran of another special effects landmark, 1933's *The Invisible Man*. As Stuart's character watches the *Mir* subs exploring the sunken *Titanic* on video monitors, Cameron uses flashbacks to tie past and present together. As the mini-subs travel over the shipwreck, the image subtly brightens as the rusticles retreat, revealing the *Titanic* reigning above the water in 1912. Conversely, shots of the ship underway suddenly turn ghostly as rusticles form along the bow, the passengers slowly disappear and the ship transforms into the sunken wreck it is today. "Psychologically, when we look at the wreck of the ship, we almost automatically imagine what it would be like in all its glory," Legato opines. "We therefore used that idea to make seamless transitions that fill in the details in your mind, and transform the wreck into what it was like when people were walking down the stairs and everything was in perfect condition. On the other hand, when you see something as grand and cool as the *Titanic* underway, you imagine what it looks like now. But we're not steering you in that direction, you're heading there already. It's just human nature, so when we actually go through this transition, it seems natural, and not 'effecty.'"

To ensure that these majestic fantasies would appear to be absolutely real, Legato used "a combination of every trick in the book. We used morphs to transition from the ship to the wreck and back — just to get them to align properly, not to show off the fact that they were changing. The transformation involves very gentle reveals of the rusticles starting to form on the outside of the ship, and then a portion of it appears as if it were shot underwater. When we were going the other way, we brightened the wreck as if it were being shot in broad daylight. Then we mixed both ends against the middle to create the final look. It's very subtle, which is something I learned on *Interview with the Vampire:* audiences look twice at certain subtleties — was it real or not real? — and those shots, when pulled off correctly, evoke a subliminal feeling and leave people with something haunting."

Legato's eerie sleight of hand extended to the *Titanic*'s passengers as well: "As the ship with the people on board is fading away to the blue underwater look of the wreck, the people themselves don't just dissolve off, they dissolve to a ghostly state, as if they're still standing on the deck of the wrecked ship, lit by the *Mir* subs. They have this almost transparent, hazy quality. It was very creepy to see these ghosts walking around on the deck of the sunken *Titanic* before they eventually dissipate. It creates a very haunting feeling."

Of course, that's something nearly everyone involved with *Titanic* experienced while filming this tragic tale of man's hubris in the modern age. "Every once in awhile when we were filming scenes in the water with the lifeboats, we'd realize that we were the same vantage point as some of the victims of the wreck," Legato says. "The difference was that we could say 'Cut' and just walk away. We realized what we were depicting — that this had really happened — and it was staggering." ◆

The sinking of the R.M.S. Titanic *will be detailed in* AC's *December posting on the ASC Web Site: www.cinematographer.com.*

Ship Building

Vision Crew Unlimited's artisans lay scale-model keels for *Titanic*.

by Ron Magid

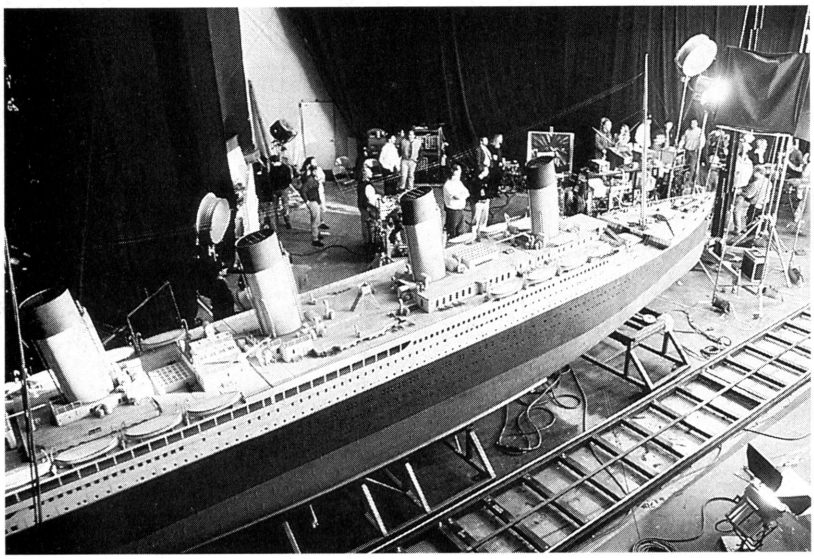
When director James Cameron began production on *Titanic*, Digital Domain's model shop was on a collision course of its own. They were already involved in building a huge number of models for Luc Besson's space fantasy *The Fifth Element* (see *AC* May '97), and were gearing up for one of the biggest miniature shows of all time, *Dante's Peak*.

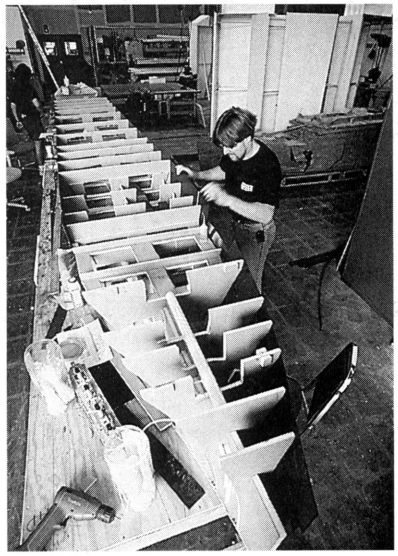
Enter John Warren, Doug Miller and Evan Jacobs, modelmakers who had formerly worked for DD and Boss Film. The three are now partnered in Vision Crew Unlimited, a boutique miniature fabrication shop. "Doug worked on *Apollo 13*, so we heard about *Titanic* when the show started," Jacobs recalls. "They told us about this museum-quality 45'-long ship with every conceivable detail and rivet — it had to be absolutely perfect, and we thought, 'Boy, we sure don't want to work on *that*.'"

With DD's stages full of *The Fifth Element*'s miniature cityscapes and the modelshop straining to pump out the mountain for *Dante's Peak*, Cameron's own project was in danger of being orphaned — but not for long. "[Modelshop supervisors] Gene Rizzardi and George Stevens decided to open up a shooting stage and model shop at Hughes Airport in Playa Del Rey," Jacobs says. The decision came not a moment too soon. "They didn't have a shop, they had an empty building," Jacobs continues. "They didn't have the personnel or the facilities in place to begin the massive amount of work to build this 45' ship, in addition to the lots of other things they had to build. When they backed into the schedule [*Titanic* was initially slated for release on July 21], they realized that they had to have the ship done in six weeks. They couldn't hit the ground running, whereas we were in a position to jump in and start right away. So they approached us at Vision Crew to build the detail



Photos by Virgil Mirano, courtesy of Digital Domain.





The 45'-long* Titanic *miniature in various stages of construction and use. The 14 modelers at Vision Crew Unlimited found themselves rapidly overwhelmed by the task of building scale versions of the vessel and its interior.

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pieces at our shop — all of the deck detail, davits, lifeboats, cranes and ventilators — and then bring it to them to put on the ship."

It *sounds* simple enough. Jacobs agrees, "It was one of those situations where you think, 'Well, we'll just pump out some model parts.' But the [real] ship had only been sailing for four days before it sank, so there weren't a lot of photographs of it. The plans for the ship were lost years ago, but we had information about the *Titanic*'s sister ship, the *Olympic*, which was similar but not the same. For example, there were a lot more lifeboats on the *Olympic* after the *Titanic* sank, and the lifeboats looked different. So we were doing archaeological work as we were building the patterns. Sometimes we had to guess from one angle in one photo what some parts would look like. Fortunately, Cameron gave us access to Ken Marshall, the preeminent expert on the *Titanic*. He's scary; he knows way too much about the *Titanic*, and had volumes of photos, but it was still difficult for us to find exactly what we needed. For example, the only way we could figure out the placement and style of the ventilators was to look at the sunken wreck photos, and say, 'That looks like one of those.' It was just unbelievable."

While VCU was busily researching and building virtually everything from the deck up at their shop, work was progressing on the hull at DD's makeshift Hughes Aircraft facility. Ever the stickler for detail, Cameron insisted that actual shipmakers construct the hull out of laminated wood. "They built it like a racing boat out of strips of wood laminated onto forms," Jacobs marvels. "Then the modelers put all of the plates on, because in reality, the hull was not flat, it was made of overlapping pieces of steel. Thank God we didn't have to do the 100,000 rivets in the hull. The [modelers] placed these jigs over the hull — because the real rivets were not laid out in straight lines, but in weird patterns — and drilled a hole for each rivet. They then placed a guy every 5' down the length of the hull, and had each of

them pound brads in with little hammers. We used to go over there and think, 'Man, I don't want to be on the rivet crew.'"

Of course, there were rivets galore on the cowls, ventilators and portholes VCU was expected to knock out. "They said all they needed from us were the detail pieces that you would plant onto the main hull," Jacobs says. "Of course, those were the pieces with thousands of rivets on them. They were all over everything, because that's how the real things had been built: the whole ship was made out of sheet metal, and it was all riveted together. Most times our patterns had the rivets incorporated in them. They were either pinheads or drops of epoxy. But a ventilator might have a thousand rivets on it, and everything had to be just perfect."

Beyond constructing 2,000 portholes with working windows, VCU's 14-man team was forced to cast many of the *Titanic*'s features entirely out of brass because of scale and stress issues. These pieces included extendable deck cranes and fully functional davits used to lower the lifeboats over the side. "In reality, the davits were 20' tall, but in our model, they were roughly 9" high and very thin," Jacobs explains. "They had to be positionable, and they had to function; each davit had little block and fall ropes, and had to be able to support the weight of a lifeboat without sagging. We made 20 lifeboats, and every lifeboat had an interior with 24 oars in it; even though the boats are covered and you can't see the oars, they're all in there."

After fabricating almost every major mechanical feature on the deck of the *Titanic*, VCU turned their work over to DD's modelers, who spent a total of 12 weeks painting and finishing the ship, a job which included the placement of small photographic TransLight interiors behind each cabin porthole. "It's insane, but I think you'll see it," Jacobs says. "The idea was that they were going to get right on top of this stuff with the camera. Typically, when you build a miniature, you build three sides — just the stuff you'd see. In this

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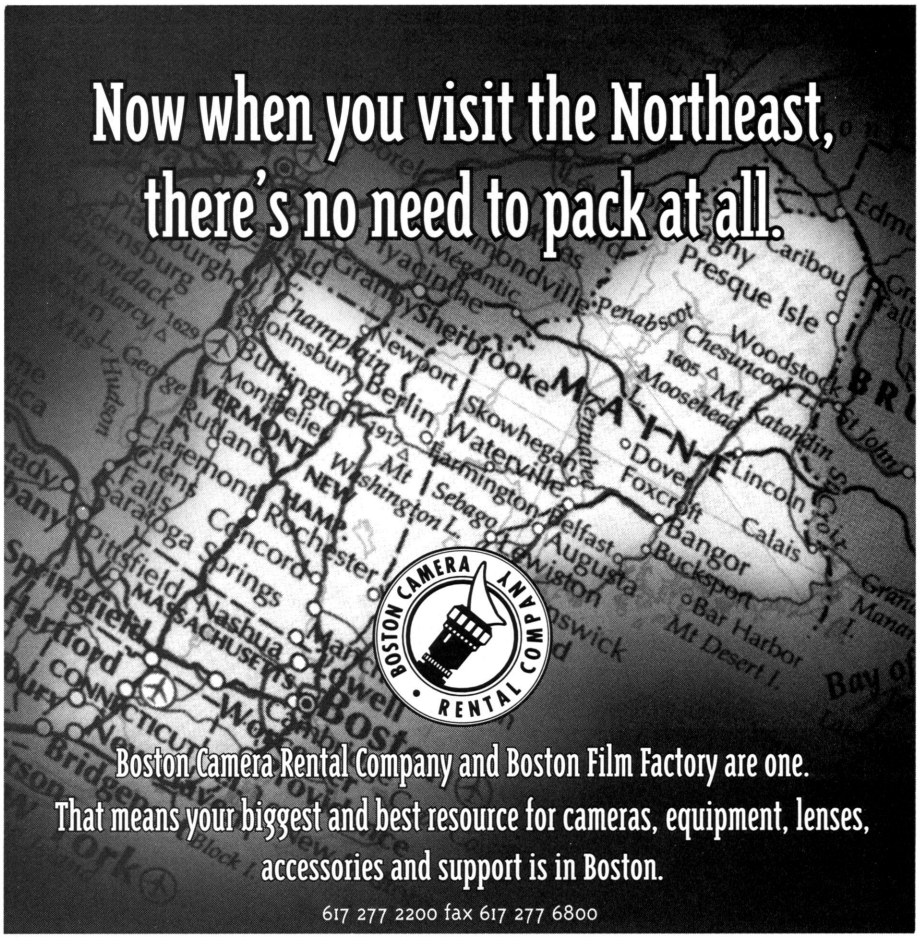
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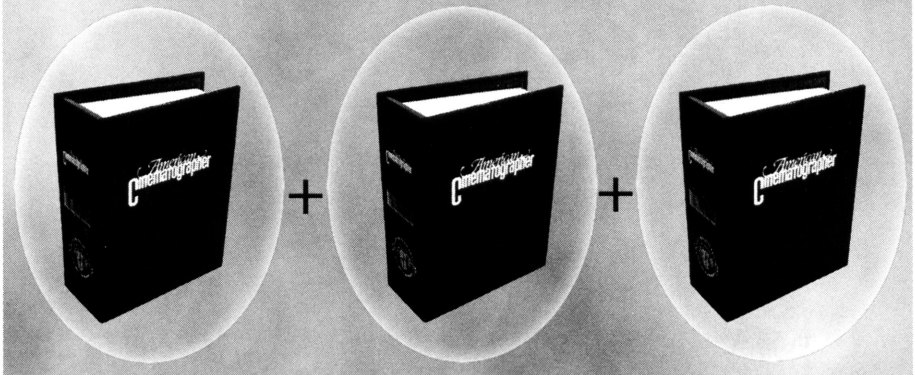
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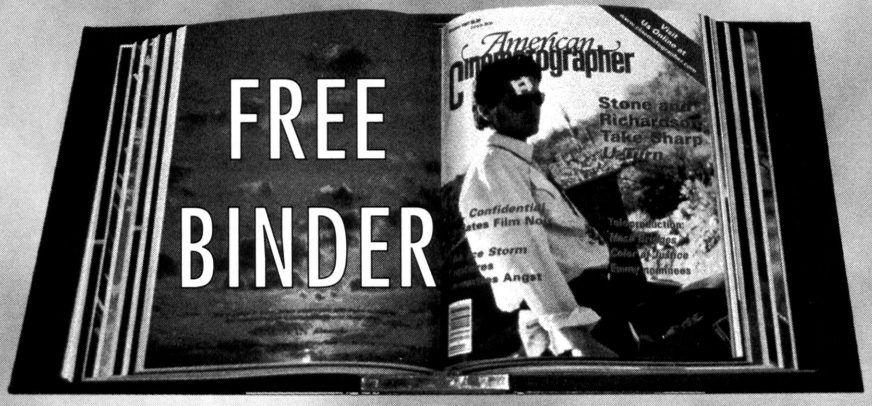
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case, the model had to be beautiful from all angles, because Cameron wanted a perfect, museum-quality miniature."

Once VCU had finished the detailing, they thought their encounter with the legendary ocean liner was over. "We said, 'Man, if we ever see another *Titanic* we'll throw up,'" Jacobs laughs. "But CBS was doing this movie of the week about *Titanic*, and they asked us to build some scale setpieces to work with water. When we were finally done with that, we said, 'Great, no more *Titanic* stuff.' Of course, we immediately got a call from Lightstorm [Cameron's production company], who asked if we wanted to build some engine-room pieces."

Cameron wanted to dramatize the moment where the *Titanic*'s massive engines went into full reverse to avoid colliding with the iceberg, but "we didn't have time to build a big, bitchin' engine-room miniature," Jacobs explains. "Instead, someone came up with the brilliant idea of shooting the engine room aboard a Liberty ship, a real World War II troop transport moored in San Francisco. Its engines are very similar to the *Titanic*'s, but one-third the size, so they decided to shoot that real engine room as a miniature. The only way to sell that was to put things in there that forced the scale. We actually took out all of the catwalks, gauges, dials and lightbulbs in certain areas — picking our angles carefully — and replaced them with ⅓-scale versions. Then VIFX composited people onto our ⅓-scale catwalks and stairways to give you a sense that the engine room was much bigger than it actually was."

This was another task which initially sounded deceptively simple to Jacobs and company: "We didn't realize that the temperature in the engine room of an old Liberty ship can reach 140 degrees! Because of that, we had to make everything out of silver soldered brass, because plastic would have sagged and melted. The [effects unit] had to get those shots in the can and prepare to composite the people in, so we had one week, literally, from the time we got the

designs, put them on a truck, drove them to San Francisco and installed them on the ship. We were sure it would be impossible, but we did it. We had 16 people working around the clock."

Jacobs brought five modelers to San Francisco to dress the Liberty ship's engine room. "We had something like 12 6'-long catwalks with handrails, and maybe eight stairways, which could be put together to create different layers. We also had big gauges and dials, along with 20 or 30 red caged lights, and we had to haul the stuff down 10 decks. The engine room was an old, greasy, nasty place, and it was very small. There wasn't a lot of extra room, and ⅓ scale is just huge. Also, since everything in the room moved, we couldn't attach any of our stuff to anything. We had a little latitude outside of frame, so we'd hang our C-stands there. It was really precarious and really hot.

"Our guys got there on Saturday night and dressed the room on Sunday, Monday and Tuesday. We then got in the ship, drove it out to sea, and cruised around the bay shooting these shots for a couple of days. They actually stopped the engines and reversed them for real. I thought it was very clever to do the scene that way, and in the long run, it probably saved the production the cost of building a big elaborate set. In addition, the subtle nuances of the real engine room would have been impossible to duplicate. The shots are very convincing."

Jacobs and his partners in Vision Crew Unlimited unequivocally call *Titanic* "the most challenging work we've ever done. Everything we did on this show was a hassle. There was never an easy task, but I think the work we did is going to pay off." ◆

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General Bethlehem (Will Patton) rules the remains of the United States with his ragtag army of terrorists. Windon and Costner opted for an anamorphic frame to fully capture the film's outdoors locations.

Dances with Wolves is a tough act to follow. Kevin Costner's sweeping 1990 directorial debut walked off with seven Academy Awards, including the Oscars for Best Film, Best Director and Best Cinematography (Dean Semler, ACS). Costner waited seven years to step behind the camera again, this time for another epic-sized tale: the post-apocalyptic adventure drama *The Postman*. In selecting his director of photography, he turned to Semler's Australian colleague Stephen Windon, ACS, who had served as cinematographer on both the Costner-produced *Rapa Nui* and on Semler's own directorial debut, *Firestorm*.

"*The Postman* is a story about hope," says Windon, who embodies the third generation of his family to work in the movie industry. His father, Ron, was a Fox Movietone newsreel cameraman who became a commercial director/cameraman; on the day Windon was born, his grandfather, Fred, was on location in the Australian outback, working as an electrician on director Fred Zinnemann's film *The Sundowners*. Thus, it's hardly surprising that the youngest Windon knew he wanted to be a cameraman from the age of eight. He received his film training at a technical college in Sydney and — after graduating in 1977 — was subsequently hired by the Australian Broadcasting Commission (ABC).

"I spent six years with ABC, working my way up from camera loader to operator," says Windon. "Everything was shot on 16mm film. During that time, I shot 26 television documentaries, operated on TV drama series, and also worked as a news cameraman, shooting on Kodak 7240 reversal news film, which was a relatively unforgiving stock. Most of my grounding [as a cinematographer] came from shooting those documentaries. Having my eye to the viewfinder for all of those years was probably the most rewarding learning experience for me, simply because I got to shoot so many films."

Windon left ABC to begin working as a second-unit cinematographer on features and TV dramas. He later returned to ABC when he got the opportunity to make the leap to first-unit cameraman on a mini-series. Several years later, in 1990, he shot his first feature, *Love in Limbo*.

The cinematographer's seventh feature film, *The Postman*, takes place 20 years after a nuclear disaster has left the United States a ruined anarchic wasteland. Costner plays a loner who masquerades as a postal worker delivering mail to holocaust survivors scattered throughout isolated townships in the Pacific Northwest. Although the Postman's true motivation is simply to procure food and shelter, the letters in his care remind people of the lives they once led, and come to foster the hope that order can be restored. As he moves from town to town, the Postman eventually attracts hundreds of

young recruits who help him convey this message of hope. The revitalized citizenry eventually takes a stand against General Bethlehem (Will Patton) and his army of terrorists, who have seized national control in the absence of a government. Seeing his power threatened, Bethlehem targets the Postman and his youthful recruits.

Through Rain, Hail or Nuclear Winter

Cinematographer Stephen Windon, ACS helps director/star Kevin Costner make his rounds in *The Postman*, a tale set in a bleak, post-apocalyptic future.

by Jean Oppenheimer



The Postman was shot last spring and summer in Tucson, Arizona; Bend, Oregon; and Metaline Falls, Washington, which is located near the Canadian border. Approximately 90 percent of the film was shot in the great outdoors, with 40 percent of the film utilizing a Steadicam.

During their initial prep discussions, Windon and Costner visited the film's locations several times, trying to decide whether to shoot the film in the standard 1:85:1 spherical format or to employ an anamorphic 2.35:1 frame. "No obvious format stood out," confesses the cameraman. "In the end, we decided to go with anamorphic, because we wanted to convey the script's 'epic' quality."

The decision to shoot in anamorphic did influence the cinematographer's selection of film stocks. Windon opted to use Eastman Kodak's EXR 5248 and 5293 for daytime exteriors and interiors, as well as Vision 500T 5279 for the film's nighttime sequences. The production also commonly utilized two cameras on most shots; their arsenal included two Panavision Platinums, a Lightweight Panaflex for the Steadicam, a Panastar for high-speed work and an 8-perf VistaVision camera for visual effects shots.

The film's extensive exterior shoot in the summer months of June and July forced the filmmakers to deal with long daylight hours predominantly characterized by direct overhead sunlight. "I couldn't use any overhead diffusion because so much of the photography consisted of wide exteriors," imparts Windon. "We tended to use 40mm and 50mm lenses — even on the closer shots — and move the camera a lot."

When shooting the wide vistas, Windon would generally position two Condors 80 feet behind the camera, with Dino lights and 18Ks mounted on them. With the Condor's boom arms stretching out across the set, the fixtures provided fill light for the landscape's large shadow areas. "With the Condors, I could get the lamps up just above the lens without using parallels," he explains. "It would have been too difficult to keep parallels out of the shot, especially since we were moving the camera so much. I would also place an extra [actor] or two in the frame to hide the bases of the Condors so I could basically shoot 360 degrees."

For tighter tracking shots, Windon would follow the Steadicam around holding a 4' x 4' white card or foamcore, which lent the actors' eyes a bit of sparkle and provided a nice soft-light fill beneath their hats.

Shooting the night sequences, however, was a different



Photos by Ben Glass, courtesy of Warner Bros.

Top: ***Some bounce fill is added to Costner as Windon (behind camera in hat) sets his frame. The summer production schedule offered long daylight hours, but Costner's penchant for wide-angle lenses made it difficult to soften the harsh glare from overhead.***
Bottom: ***Bethlehem's troops on the march. The low-tech, post-apocalyptic setting allowed Costner to again explore the Western genre.***



The Postman picks up the outgoing mail. The shot was photographed with an extremely long lens at 110 fps to stabilize the image and make Costner's expression readable to the audience.

matter entirely. Windon notes that *The Postman* involved the biggest night shoots that he or gaffer Jim Gilson had ever executed. "At one point, we had to light an enormous, old, open copper mine — located just outside Tucson — that was over 1 ½ miles across and 1,200 feet deep. It was basically like a huge crater that took 25 minutes just to drive down into! In the story, the mine served as the camp of General Bethlehem's army."

For nighttime scenes at the mine, Windon wanted to bathe the location in a blue moonlight ambiance. However, he opted against setting up Muscos or other large night-illumination fixtures because he feared that the lighting would be too flat. Instead, he "ended up using about 25 6K HMI Par lamps, which were very concentrated in their intensity. Jim Gilson placed a ring of these fixtures around the mine's perimeter, shining down into the crater. The Pars created little pools of light, which gave the mine more texture than one or two really big sources would have produced."

Bethlehem's camp was also filled with campfires that billowed smoke and offered additional illumination solutions. "We positioned a number of Maxi Brutes behind buildings and in rock canyons," submits Windon. "I put orange gels on them and placed large smoke machines in front of them, which created massive orange glows coming out from behind the canyon walls and gave me big light sources."

The expansive mine floor even encompassed a lake which the production decided to incorporate into the film's visual design. In one scene, Bethlehem's troops watch films projected onto a huge screen set up on a ridge beside the body of water. A projector was set up on a floating dock anchored some 350' away from the screen. "Kevin and I originally wanted to play the movie live while filming," recalls Windon. "Even though I shot tests in preproduction, I could never get a bright enough exposure from the projected image — even with the latest and greatest projectors — because of the distance and scale of it. So I had to simulate a beam of light coming out of the projector with a 2.5K HMI Par and smoke added to the air. I then lit the screen with white light to give the visual effects people a clean matte line around the screen for the images to be added later with CG."

Save for the projected movie in Bethlehem's camp, the post-apocalyptic world of *The Postman* is rendered without onscreen electricity: moonlight and campfires provide the only illumination. For "firelight," Windon used tungsten lights covered with full CTO gels, which were bounced off gold reflector boards "to get a really red/gold look." The lamps sat on low stands just off camera; grips would then tap the reflectors or give them a little shake to create the effect of fire.

To achieve the night scenes in the Metaline Falls location, Windon had the grip crew rig an enormous, 40' x 20' moonbox. "I had seen the moonbox in a lighting rental company in Vancouver when I was doing *Firestorm*," Windon adds. "It was the only one I knew of in existence, so I had it shipped down for *The Postman*." The box was fashioned out of a silver, foil-like reflector material which was then stretched over an aluminum frame; the cube was suspended from a 210'-high crane and contained 60 1K lamps. "I put full CTB gels on each of the lamps, which created a big, diffused light source at around 4300° Kelvin."

To aid in the unit's flexibility, each of the moonbox's 1Ks were on individual dimmer channels. Although Windon normally had all of the globes switched on, he could adjust the amount of light coming from the moonbox by either switching banks of lights on or off, or dimming them. By hiding the crane behind buildings along the street, an entire two-block area could be illuminated. The moonbox, however, was used only for the widest shots in the sequence. For closer action, Windon bounced HMIs (partially corrected with ⅓ CTO gels) off a 20' x 20' Griffolyn which could be more easily placed and controlled.

As *The Postman*'s story progresses, the film's color scheme undergoes three major shifts, reflecting the emotional changes in the narrative. The early Tucson scenes have a coolish blue, monochromatic feel; Windon had toyed with the idea of shooting this section in black-and-white, but ulti-

Linda J. Brown

"I like working with visually sophisticated directors who drive me outside of my comfort zone. Sometimes my best work isn't perfectly lit. It just feels right. That feeling comes from a primal place buried inside. I think it's something you are born understanding. You can never run out of new ideas, because the study of lighting is endless. If I won the lottery, I'd still be out shooting. I love telling stories with film." Linda J Brown

Linda Brown's credits include *Walking To Waldheim, Hitchcock's Gun* and *The Poet's Wife* which earned a Cine Golden Eagle. She shot episodes of Showtime's *Women: Stories of Passion*, plus various documentaries and music videos. In addition, she won the 1996 Women In Film TV cinematography Vision Award sponsored by Kodak.

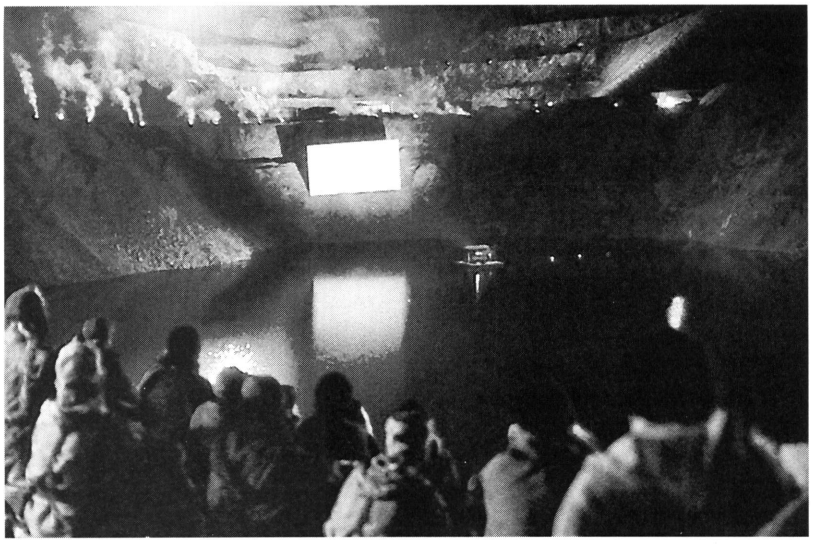
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Bethlehem's men enjoy a movie at their camp. The copper-mine location was lit with a circle of 25 6K HMI Pars to create pools of light, while another HMI Par was used to create the projector beam. The screen image would be inserted in postprocduction.

mately scrapped this idea. "The film starts out very bleak," he notes. "I used very little filtration and went with tungsten film stocks [for the daylight scenes], which left me with a little bit more of a blue and desaturated image on the negative."

As the Postman furthers his foray north to Oregon and then Washington, the surroundings become more beautiful due to the environment's trees, greenery and mountains. Here, Windon slowly added more color and warmth to the photography.

The Oregon portions of the film actually called for two distinct looks. Initially, the Oregonian setting is wintery and desolate when the Postman and his companion (British actress Olivia Williams, making her screen debut) stumble upon a cabin and get snowed-in for six months. Notes Windon, "I used an 81C filter, which isn't the normal full correction you would use with a tungsten stock, so the film still looked blue." Inside the cabin, however, he created a more golden look, a reflection of the candlelight and firelight which illuminated the dwelling.

For scenes that occur as the snow melts and the characters leave the cabin, Windon switched to a more natural ambiance. "Nothing too golden, though," he notes emphatically. "There I used a regular 85 filter to give the actors more normal skin tones." For later scenes in Washington, Windon created a heavy golden aura with a combination of 85 and Coral filters and a CC-20 yellow.

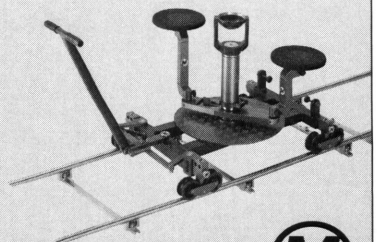
To elicit subtle emotional moments in the film, Windon notes that the filmmakers performed a lot of in-camera speed changes. In one scene, Williams' character watches as the Postman rides out of town. "We were pushing in on Olivia on the Steadicam," recounts

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the cinematographer, "and we ended up on a close-up as her hair was blowing a bit. We ramped the camera from 24 fps to 36 fps on that shot so that it was just a little bit in slow motion to enhance things like the way she'd blink her eyes. [The use of subtle slow motion] just took the edge off of it."

Windon offers a detailed description of a long take which he labels "the signature shot of the film." In it, Costner is riding by a farmhouse at full speed when a little boy runs out with a letter — he has just missed the Postman. The Postman stops his horse, turns around and looks back at the little boy standing there with the letter in his hand. "We then did a shot which I love where the Postman gallops back at full speed," says Windon. "We did the shot with Panavision's 270-840mm 3:1 anamorphic Primo zoom lens. [With such a long lens], as someone riding a horse gets closer and closer, they get very blurry, because of their [size in the frame and] motion blur. To correct this, we sped the camera up so that you could see the look of determination in the Postman's eyes. He was riding straight at the camera, towards the little boy as we were shooting across the back of the boy's head with his little hand in the air holding the letter. We were rolling at 110 fps when the Postman snatched the letter out of the boy's hand. We then tilted down to the boy's face as he turns to look at The Postman riding away, smiling as we ramped back down to normal speed.

"If we had kept that whole scene at normal speed," he continues, "the action would have happened so fast that we never would have been able to tell the story. We used the camera [and frame-rate] to convey the emotion on their faces. Slowing things down lent the



An overhead moonbox of 60 individually dimmable 1Ks was used for this exterior sequence, allowing Windon to make subtle adjustments.

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Sunlight and firelight were Windon's primary sources in the film, as the storyline dictated that electricity had become a thing of the past. Warmed tungstens bounced into gold-foil reflectors supplemented campfire scenes.

sequence a dreamlike quality."

Given *The Postman*'s futuristic setting, and many effects, Windon engaged in a lot of planning and preparation with visual effects supervisor David Negron (see accompanying story). The cinematographer used a VistaVision camera for effects shots so as to exploit the format's larger negative area. If a scene called for dialogue, action and a large visual effect — say, a tall mountain that didn't exist in reality but would be incorporated in post — the added negative area allowed room for any slight repositioning necessary to accommodate additional visual elements. This was also a factor for the film's oft-used sky replacement effects. Windon found Tucson's beautiful, blue, cloudless skies to be boring and candy-colored, so sky plates were shot throughout production, whenever the heavens offered something unique. By the end of the shoot, a library of some 200 dramatic skies and strangely-shaped clouds had been collected so they could be composited into scenes via computer.

Windon testifies, however, that the visual effects didn't slow down his pace considerably, or make his job more difficult. "Of course, you always have to consider the requirements of the visual effect, and try to give the digital artists what they need to do their work," he notes. "But one piece of equipment which made things much easier for the visual effects people and me was the Libra III remote camera head."

Shooting for visual effects on the main unit can be very difficult and time-consuming, especially if camera movement is required — even if that move is only a simple pan. Until recently, filmmakers didn't have many choices other than costly rotoscoping techniques or the use of cumbersome motion-control rigs. But while visiting his first assistant cameraman, Tony Rivetti, on the set of *Contact* (see *AC* July '97), Windon was introduced to the Libra III, which can be hooked up to a computer and "has encoding capabilities," Windon explains. "When you pan and tilt a camera, you can measure [the movements] by using an X-Y axis scale, and we could store this encoding information in a laptop computer. When I shot a greenscreen scene and then a background element, I could do an identical camera move because the computer had stored it in its memory. I could get the exact duplication of the perspective and speed of a pan."

Without computer attachment, the Libra III can also be utilized as a normal remote camera head, and Windon exploited its versatility throughout *The Postman*. This feature proved to be particularly handy during the filming of a hair-raising sequence shot on a 300-foot long suspension bridge constructed expressly for the film. Steadicam operator David Crone, who also served as A-camera operator, had the difficult task of maneuvering along the 4'-wide bridge while Windon, Rivetti and dolly grip Levon Bosnelian worked around him. Windon had high words of praise for Crone and the rest of his crew, which also included B-camera operator Richard Merryman, key grip "Bear" Paul and second-unit director of photography Alexander Witt.

After *The Postman* wrapped, Windon was back at work with Dean Semler on *The Patriot*, the Oscar-winning cinematographer's second directorial effort. ◆

The Postman Makes Rounds in Realistic Futurescape

Visual effects experts deliver a post-nuclear United States where wild animals prowl dramatically blasted terrain.

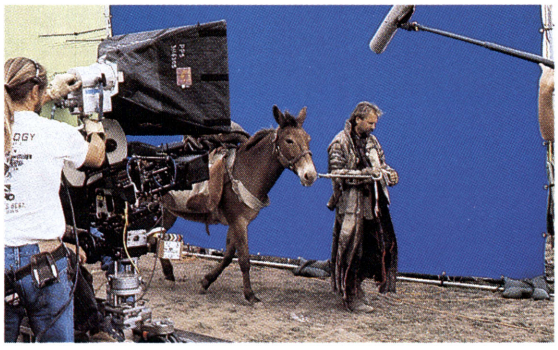
by Ron Magid

The Postman, the first film directed by and starring Kevin Costner since his multi-Oscar-winning *Dances With Wolves*, takes place in the ruined U.S. of the future, a desolate badlands in which nature's delicate balance has been torn asunder by a nuclear holocaust. Only a man with no name, masquerading as a mailman, can put things right.

In Costner's post-apocalyptic vision, lions prowl the barren American desert, where the once-flat landscape is now strangely dotted with mountains and pine trees, and skies blaze in a perpetual nuclear sunset punctuated by sporadic flashes of lightning. The director initially hired Tricia Ashford, fresh from her pivotal role as digital effects supervisor/producer on *Independence Day* (see *AC* July 1996), to handle the low-key, highly realistic effects. Ashford, in turn, brought in effects cinematographer Phillipp Timme, another *ID4* vet, to shoot the various elements needed to transform *The Postman*'s contemporary Oregon and Arizona locations into a post-war wasteland of the future. "When we started, the main direction involved a lot of location and background enhancement, changes in the skies, subtle things like that," Timme recalls. "We planned to gather a library of background plates, sunsets and clouds, because it was very hard to pinpoint the specific shots they would be needed in. While we were shooting the elements, most of the plates they would be going in hadn't been shot or were just being shot."



Photos by Ben Glass, courtesy of Warner Bros.

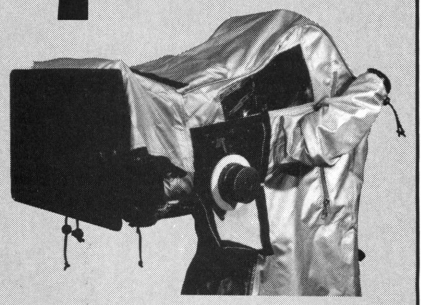


Ashford's decision to shoot the elements before the background plates ran counter to conventional wisdom, but she felt that this strategy was necessary in order to meet *The Postman*'s December release date. "It's something Tricia chose to accept, and it's understandable given the fact that [Warner Bros.] wanted to open in December with less than three months of postproduction," Timme opines. "I understand why Tricia went that way, because it was very hard to lock down specific shots. That seems to be the tendency these days: you get storyboards that usually come with a little note that says, 'Don't take these literally.' It's very hard to shoot things for a specific boarded shot if that shot changes when the first unit finally films it. We were trying to shoot elements in Oregon to enhance shots that the first unit was going to shoot in Arizona three weeks later, without knowing exactly what those shots would be. If there had been more time, Tricia would have said, 'Let's wait until we get all of the desert background plates shot, then we'll go out and shoot the mountain and pine-tree elements.'"

Ironically, that's exactly what the film's storyboard artist, David Negron Jr., decided to do when he replaced Ashford as *The Postman*'s visual effects supervisor just prior to the end of production. The working relationship between Ashford and Costner had cooled due to a series of miscommunication problems, and so it was Negron

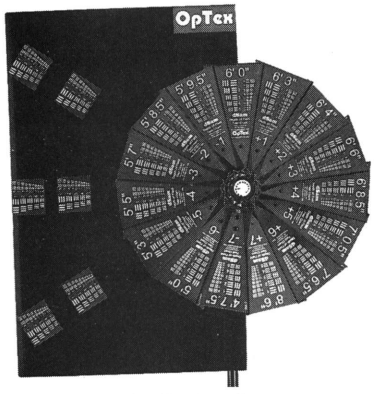
Above: ***The rope bridge as reconstructed on the greenscreen stage for close-ups.*** **Left:** ***Costner leads his mount. The post-apocalyptic milieu dictated environmental havoc, demanding that numerous landscapes and skies be replaced with more exotic renderings.***

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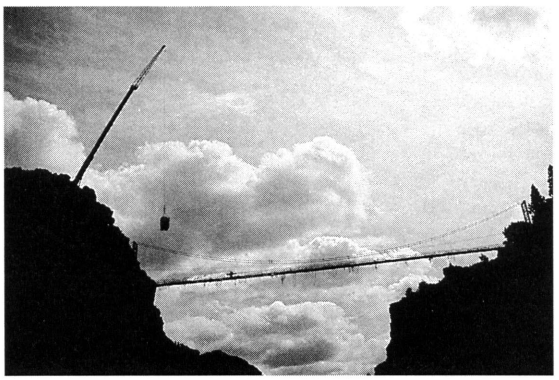


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The actual rope bridge from which the Postman plunges. Ashford's ambitious plan to create a 360-degree tiled background of the location for the subsequent greenscreen work was later abandoned.

who had to finish 150-plus visual effects in time for the film's Christmas release. "They let Tricia go a few weeks before we wrapped, when we were coming back to L.A. to do the majority of our greenscreen work," Negron recalls. "I had worked as a visual effects supervisor on *Jo Jo Dancer* and done effects on *King Kong* [1976] before I segued into storyboard work. On films like *Clear and Present Danger*, *Fearless* and *Speed 2*, I was not only a storyboard artist, I also designed all the visual effects shots. On *The Postman*, I was helping Kevin figure out how to do all of these visual effects shots on paper, so when Trish left the project, Kevin brought me in to finish the show."

Ashford's downfall may have been that her concept of doing effects mainly in postproduction — which had worked spectacularly well on the huge *ID4* project — was simply unsuited to a low-key effects film like *The Postman*. "I think Tricia's approach was very much that of someone who had grown up in postproduction and who was used to postponing the effects work, as opposed to somebody coming from the live-action side who was used to doing more work on location," Timme says in retrospect. "I just tried to shoot as much footage as I could."

[Ed. note: AC*'s attempts to reach Ashford for comment were unsuccessful.]*

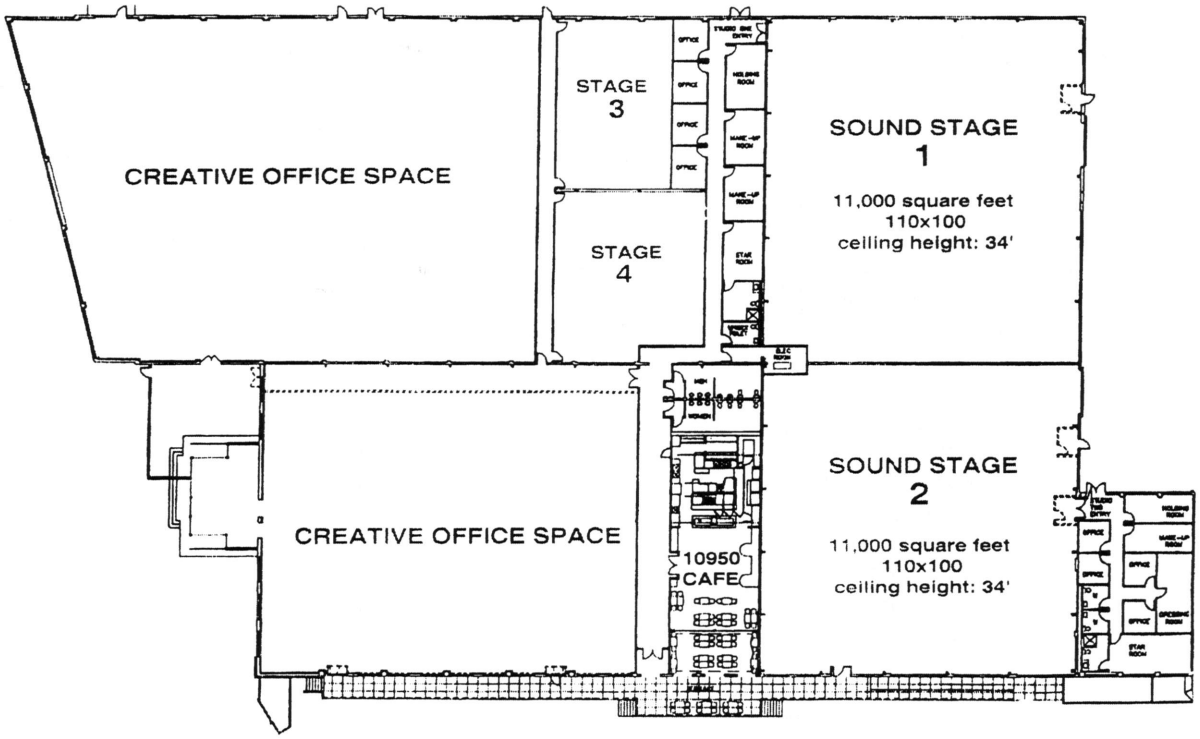
Although Timme's role ended when production wrapped, he subsequently had conversations with Negron in which he explained Ashford's intentions for assembling the various effects shots. "It's very difficult to take over for somebody else when you have 130 rolls of VistaVision footage which don't carry any designation except for weird slate numbers," Timme explains. "Thankfully, we had logged these plate data sheets with information about camera height, sun direction and time of day, filters and lenses, among other things. I went through this book of notes and drawings with David, marking the shots that had been done for specific elements and things like that."

Negron was able to use many of the elements and background plates that Timme had shot for Ashford, particularly in *The Postman*'s opening sequences, which take place in a massive dry lakebed and a vast parking lot loaded with cars. The dry lakebed sequence was filmed in a rock quarry called Leach Ponds in Tucson, Arizona, where the production built the remnants of a marina, with a dock and a beached boat, in the sand-filled environment. Working at Cinesite with former ILM CG supervisor Jay Riddle (*Star Trek VI*), Negron used digital mattes to remove the berm of dry sagebrush behind the Postman and his mule as they traverse the wasteland, creating one of the largest — and most bizarre — lakebeds in cinema history. "Kevin and I never could find a landscape that was just right, so we designed this valley he was after," Negron explains. "I went out and shot mountains that fit with my designs, and we then took the mountains out of those plates and dropped them into the desert to create a whole new scene. Since there were so many shots with Kevin walking across the dry lakebed, I had to cover angles for all of those mountains to match the angles of the background plates. I found that the best way to film the mountains was to wait for frontlight; that way, you avoid having shadows, which can

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always be added in later. If the shadows are already there, they're much harder to remove."

As he journeys across the lakebed, the Postman is tracked by a male African lion. Costner envisioned a tense and unsettling reveal that would also serve as a unique time transition: as the camera panned over the Postman's dusty footprints in the baked soil, the director wanted to tilt up to reveal the lion in heavy rain, all in one shot. To accomplish this, Timme used a unique motion-control rig to film the lion on a 30' x 30' section of the dry lakebed, which was built on location in Oregon and dotted with faux footsteps. "Since we were shooting on location, where we didn't want to carry any more equipment than we needed, we decided to use the Libra III remote head as a motion-control camera; the production's cinematographer, Steve Windon, [ACS] was already using it for other types of shots," Timme explains. "The Libra head has the nice feature of storing a camera move on a RAM card, which can then be played back. The only problem is that the RAM card doesn't sync the shutter to the camera move, and can be offset by as much as half a frame, which makes motion-control work impossible. Fortunately, the makers of the Libra head were able to provide us with an interface for a laptop computer that runs the Mark Roberts motion-control program. By inputting the pan-tilt-roll data into the Mark Roberts motion-control environment, we could store the motion-control move together with the camera shutter information, which allowed us to play back the move with a sync shutter. Using this system, we were able to do live-action motion control on location without having extra motion-control equipment or an additional motion-control operator."

This unique technique didn't solve all of Timme's problems, however; once again, the pieces of the puzzle needed to complete the effects shot were filmed out of the usual sequence. "We shot a background plate of the dry lakebed in Arizona, and then we shot the lion separately against

greenscreen on our set in Oregon, so we had to hope that our background plate would work with this shot," Timme says. "Actually, we ended up using a still I had shot that was at the right height to work with the foreground elements. Another problem was that lions don't like to be in rain, so I had to shoot a separate pass with rain only in front of black using a rain machine. I ended up shooting a plate with the lion, a plate with the rain and a clean plate using the remote head."

Timme also supervised the shooting of background plates for the car lot sequence, in which the Postman navigates his way through a sea of some 15,000 vehicles. "In reality, there were only 40 cars, spread out in such a way that Kevin could walk through the middle and interact with them," Timme reveals. "The other cars in the lot, along with 20 carriages loaded with cars on a stationary train, were cloned in later. We took measurements of the parking lot and the cars and took lots of pictures so we could triangulate the camera position and extract the camera motion."

In one of the stranger examples of product placement, this post-nuke auto graveyard was populated with Taurus sedans cloned from a CG wireframe Negron actually got from Ford Motors.

Like the shots involving the dry lakebed, the car lot sequence is enhanced by some impressive sky replacement work. Negron promises that these shots will have nothing in common with the most infamous sky replacement film of all time, *Damnation Alley* (see *AC* Nov. 1977), which was set in a nuked world of strangely hued and streaked skyscapes. "I know it's really dangerous, but we were pushing for more of an artistic touch," Negron says. "We've manipulated real clouds in such a way that they still look familiar, and then added them to our plates. Phillipp shot some very good time-lapse photography, which enabled us to have our clouds moving at a little different speed than reality. We were originally going to go with full-blown nuclear black skies with lightning in the background,

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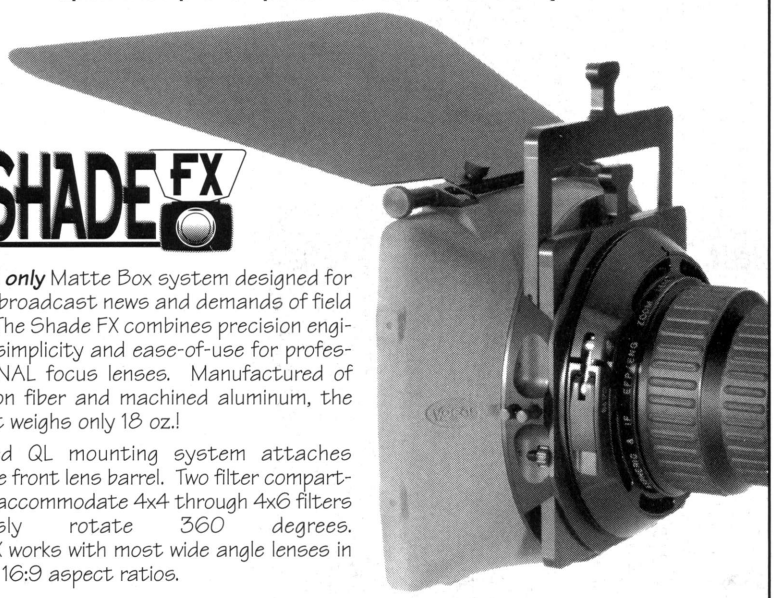


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but we toned that down to more of a tobacco-like, dirty film look with a kind of nuclear rain shimmer. We used a technique called hue color separation, which allowed us to digitally remove the hue colors in the sky. If we selected blue, we could remove just that color, and then replace it with another color in the sky. Cinesite has specifically designed software to control the hue colors, which enabled us to not only remove single colors, but also gradients in the sky. When the Postman wandered into higher elevations, we created this blue-to-orange gradient that helped us transition into blue skies again."

Some 25 shots in three other sequences involving wire removal, digital mattes and other "invisible" effects were handled by Caliban Filmworks, using Quantel's Domino system and Discreet Logic's Inferno software.

One of the trickier scenes for Negron to assemble was a hair-raising rope-bridge sequence, during which the Postman finds himself trapped over a chasm with men on horseback blocking his path at one end of the bridge, and two more riders galloping after him from the other side. Our hero's only chance for escape is to take a 300' plunge into the river below. The completed effects sequence involved a spectacular stunt in which Costner's double leaped off the real bridge wearing a wire rig, as six cameras captured the action. This moment of derring-do was combined with shots of Costner jumping off a section of a fake bridge shot against greenscreen. When Negron attempted to put the sequence together, however, he didn't seem to have the shots he needed for the various background angles. He recalls, "The camera was off the shot in some frames, so we had to steal footage from other shots and put those pieces in. Also, when they shot the plate of the far end of the bridge, the guys on horseback weren't in the shot at all, so I had to do a major repair job."

This absence of appropriate backgrounds was due to the production's deviation from Ashford's original approach. Knowing she would have to create any number of background plate views for the rope-bridge sequence, which was largely shot without motion control, Ashford opted to shoot photographic tiles of the entire 360-degree panorama surrounding the bridge, and then re-create the environment in the computer. This may arguably have been a more economical method to do lots of shots, rather than creating individual background plates for each shot. But it may have been a bit too esoteric for Costner the director, who was learning about using effects on this film. "I'm sure there were a lot of shots that didn't make sense to anybody just looking at them," Timme concedes. "We'd shoot the same view with three different lenses so we could match them if they shot a plate later with a certain lens. We planned to do what Tricia called 360-degree texture mapping for the backgrounds of all the shots that weren't registered on the bridge, so we shot tiles in all directions from the middle of the real bridge. That way, Tricia could extract the motion from the Steadicam shots by tracking registration points in the frame, and then apply that data to the entire background. Her idea was to create a wireframe background for the two sides of the bridge and the river down below, and use our plates as texture-mapping."

The fact that these backgrounds were just tiles which were to be combined into a surrounding environment explains why certain views weren't framed wide enough for Negron's purposes. It also answers the question of why the horsemen were absent from the opposite side of the bridge: the horses would have been added later to the tiled environment.

It's unlikely that audiences will be aware of the communication gaps that plagued *The Postman*'s assembly stage when they experience the film's spare, simple imagery. "Some of the stuff in *The Postman* is so real-looking, you're not going to believe it's a visual effect," Negron insists. "But we've got a very good picture that can work without these visual effects. It's definitely an actor's and a director's movie." ◆

A Rollercoaster Year for Visual Effects



Composite courtesy of Pacific Data Images.

The year 1997 has been a watershed period in the history of visual effects, one that recalls Dickens' most famous line: "It was the best of times, it was the worst of times."

Over the course of the past 12 months, audiences have experienced some of the most accomplished visual effects work in history, in more effects-laden films than have ever been released in a single year. Taking into account the long-awaited unveiling of the CG-enhanced *Star Wars* trilogy, 1997 became the first year in which each of cinema's reigning "effects auteurs" — George Lucas, Steven Spielberg, Robert Zemeckis and James Cameron — all presented theaters with envelope-ripping work. The result was a parade of spectacular imagery that included *The Lost World*'s next generation of CG dinosaurs; a visit to the furthest reaches of outer space in *Contact;* and *Titanic*'s descent to the oceanic depths.

**From top: *The Dynamic Duo surf in from the upper reaches of the stratosphere in* Batman and Robin; *Edgar the CG bug threatens* Men in Black*'s intrepid agents; astronomer-turned-astronaut Ellie Arroway travels to the far side of the galaxy in* Contact.



Composite courtesy of Columbia/Tristar.

But this triumphal pageant has also had its melancholy moments. Despite the fact that Boss Film created effects for *Turbulence* and *Air Force One,* and also contributed to *Starship Troopers,* Richard Edlund, ASC, was forced to close his firm's doors in August. Warner Digital, the in-house effects unit of Warner Bros., was closed by its parent company, even though its artists had enriched the look of *Batman and Robin.* Meanwhile, amid all of this turmoil, VIFX (*The Relic*) and Blue Sky Studios (*Alien Resurrection*) merged their respective teams, and were purchased by 20th Century Fox.

Considering the fact that audiences didn't flock to many of this summer's sleight-of-hand spectaculars, prospects for the effects sector might seem a bit grim. Even the venerable *Wall Street Journal* has cited the facility closings and box-office disappointments as evidence that the visual effects industry is poised on the brink of collapse.

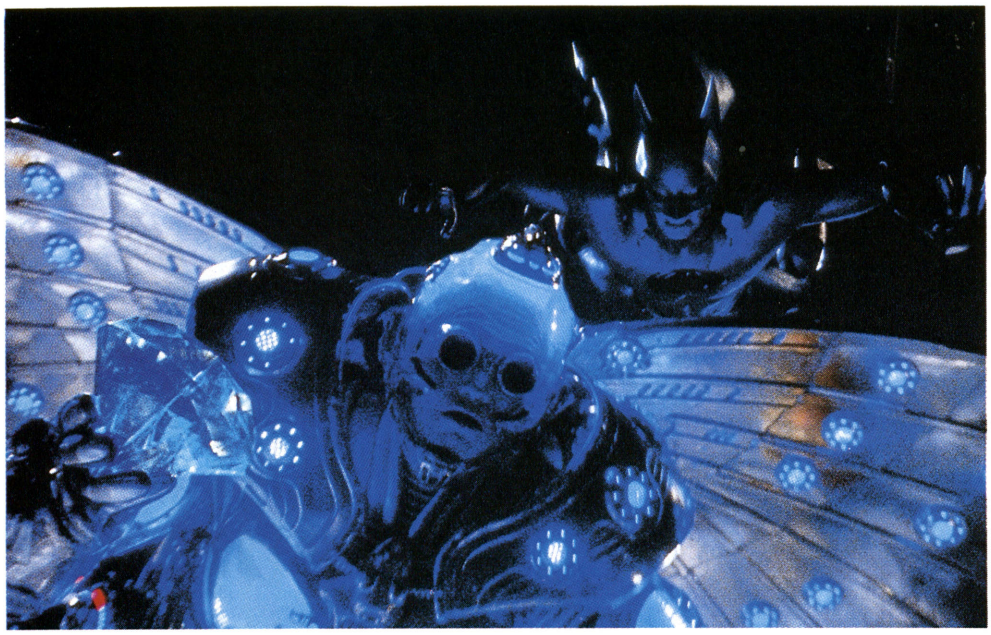
In our opinion, however, nothing could be further from the truth. These closures are more likely the result of a phenomenon that occurs in many high-growth industries: rapid expansion can lead to equally rapid consolidation, but the field is essentially healthy.

Anyone who doubts this has only to look a very short distance into the future. Even if every event picture bombs next year (an unlikely prospect, given the arrival of such hotly anticipated projects as *Godzilla* and the *X-Files* movie), audiences will still be primed for the 1999 release of the first of George Lucas' three planned *Star Wars* prequels. That series of films alone should be enough to keep the effects business juiced through the year 2010. And by that time, so many films will employ some kind of digital techniques that the very term "visual effects" — and not the artists themselves — will be the only aspect of the field that is likely to disappear.

—Ron Magid



Photo by Francois Duhamel, courtesy of Warner Bros.



Composite courtesy of Pacific Data Images.

Digitizing the Dynamic Duo

Visual effects superheroes John Dykstra, ASC and Andrew Adamson add outlandish excitement to *Batman and Robin*.

by Ron Magid

Batman chases the iridescently armored Mr. Freeze as he flies back to Gotham on mechanized wings. A combination of CG and model work was used to create the cityscapes.

Though visual effects supervisors John Dykstra, ASC (*Star Wars*) and Andrew Adamson (*Angels in the Outfield)* successfully collaborated two years ago on *Batman Forever* (see *AC* June '95), the pair managed to up the ante with the Caped Crusader's computer-generated exploits in *Batman and Robin* (*AC* July '97). "We made it as over-the-top as we could," says Dykstra. "That was the beauty of the film: it could be surrealistic, it could be colorful and it could defy physics. We created action sequences that start where more conventional action sequences end."

Extensive effects planning for *Batman and Robin* began in a computer environment. Dykstra, Adamson and production designer Barbara Ling used detailed previsualization techniques to vivify Gotham City and later crystallize it when Mr. Freeze (Arnold Schwarzenegger) makes the metropolis an extension of his domain. Before models were constructed, a virtual Gotham City was created in which each edifice could be positioned for optimum effect. Camera moves could then be programmed to produce many animatics of each shot. According to Dykstra, once the animatics were approved by director Joel Schumacher, "the actual physical models were created to match the proportions and scale of those in the computer. As a result, the animatic camera moves were applicable in the real miniature photographic environment. Once we had a three-dimensional computer blueprint for these models and their positions, along with all of the camera moves, we could construct 3-D computer-generated buildings and 2-D matte paintings to extend the miniature city, as well as add ice to it, all at the same time. Consequently, there's more exposure of Gotham in all of its vistas — wide, medium and close."

Ultimately, more than half a dozen effects houses worked on *Batman and Robin*, including BUF Company, CIS, Pacific Title Digital, Pacific Data Images (PDI), Rainmaker, Rhythm & Hues and the recently disbanded Warner Digital. BUF Company (the French firm responsible for *The City of Lost Children*) created Poison Ivy's virulent vines and flora and her misty, wafting pheromones; the Gallic effects house also collaborated with Warner Digital (*Mars Attacks!*) to develop the specialized arsenal of Mr. Freeze. The icy bolts pulsating from the frigid foe's Freeze Ray, for example, required an abundance of digital ray-tracing for believable refraction. "That was very complex, something we never would have considered attacking even two years ago," Dykstra testifies. "The water creature [from *The Abyss*] was a heroic effort, but we found ourselves doing that [same procedure] threefold. Warner Digital created the frosty blasts fired from Mr. Freeze's handgun, and BUF Company made the giant Freeze Ray fired from an observatory-style telescope. Both weapons propagated ice from a single source, and had contact illumination and vapor coming off them — all of it generated in CG."

One of the film's more outlandish sequences — a rooftop car chase across Gotham's skyline — entailed a daring mix of live-action, miniatures and CGI. After wreaking havoc at the Gotham City Flower Ball, Mr. Freeze escapes in his Freezemobile. The übervillain leads Batman (George Clooney) and Robin (Chris O'Donnell), who are giving chase with the Batmobile and Redbird motorcycle, on a merry trail across Gotham. Eventually, Freeze abandons conventional roadways: using his Freeze Ray, he crystallizes a metal guardrail to create an ice ramp onto one of the gigantic statues that loom over the city. At

incredibly high speeds, Batman and Robin follow Freeze over the ice ramp, across the statue's shoulders and down its arms some 2,000' above street level. The Freezemobile then makes an 80' leap from the statue's hand onto an adjacent rooftop, with the Batmobile in hot pursuit.

Dykstra used a revolutionary approach for the live-action process photography of actors Clooney and O'Donnell as they appeared to climb across the huge statue. "We used large-format PIGI projectors, which have a Xenon source and are often used to project backgrounds for stage productions. But instead of doing traditional process, which involves an intermittent pulldown of individual frames of film, we used a big strip for the backing and moved it continuously — almost like a strip projection — onto the rear screen, as our principals climbed down the statue's shoulder and arm. The technique was similar to the old cycloramic backings that scrolled across two rollers behind the actors, only this was film projected onto a rear screen.

"Every effects house participated in this scene," notes Dykstra. "The 1/24-scale miniature backgrounds were shot by the Chandler Group, and then combined with a 3-D computer-generated city and 2-D matte paintings and miniature and CG vehicles, plus the 3-D Freeze Ray. We intercut process shots of George Clooney in the full-sized Batmobile and Chris O'Donnell on the Redbird with miniature and CG versions of their vehicles. When the Batmobile leaps from the roadway to the statue, that's a ¼-scale miniature attended by a computer-generated motorcycle ridden by a CG Robin, created by PDI. We used Warner Digital's CG Batmobile in the wide shots, but the 80' leap from the statue to the building again involved the miniature.

"It's getting to the point where the seams are hard to see," Dykstra concludes. "I think we did a pretty good job of flummoxing people as to what's CG, what's miniature and what's live action." ◆



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Composite courtesy of Columbia/TriStar.

Bugging the *Men in Black*

ILM sics a giant space roach on actors Tommy Lee Jones and Will Smith.

by Ron Magid

Edgar the evil bug confronts MIB agent J. The creature was originally to have been rendered via elaborate puppets constructed by make-up artist Rick Baker and his crew, but last-minute script changes demanded a CG solution.

With audiences being bombarded by an onslaught of sci-fi in theaters and on television, devising unique extraterrestrials is no easy task. But ace makeup effects artist Rick Baker, a recent Oscar winner for *The Nutty Professor*, and Industrial Light & Magic nevertheless conceived a slew of inventive aliens for this summer's smash hit *Men in Black* (see full coverage in *AC* June '97). Particularly noteworthy was the gigantic, grotesque Edgar bug, which ILM fashioned entirely with computer graphics.

In the initial concept for the story, the giant space bug which emerges from human country-bumpkin Edgar (Vincent D'Onofrio) was supposed to converse, and not clash, with the MIB agents. Consequently, Rick Baker created two animatronic talking versions of the Edgar bug that subsequently had to be shelved following extensive rewrites of the film's climax. Ultimately, ILM animated the Edgar bug via CGI, in accordance with some of Baker's schematics. "The Edgar bug's role changed from a monster who talked to one who didn't talk at all," says ILM visual effects supervisor Eric Brevig (*Indian in the Cupboard*, *Total Recall*). "Instead, Edgar leaped around, fought Agent J (Will Smith), ate Agent K (Tommy Lee Jones) and did all of these amazing things, most of which a physical monster suit couldn't have done. Rather than hanging on to the original design, which might have handicapped the sequence, we decided to use a computer graphics version so Edgar could better do what the script needed."

"Edgar was really challenging, because he fit inside a 6' person even though he was 12' tall," offers ILM animation supervisor Rob Coleman (*Dragonheart*). "We had to create a character that could be folded up and stuck inside a human being. It's a bit of a cheat, but it tested fine with the audience. When the alien finally bursts out, he becomes our CG character: this huge space cockroach with six legs. The Edgar Bug is a hybrid of a cockroach, a praying mantis and a scorpion. He's cockroach brown and black, and really slimy — quite disgusting, but a lot of fun to work with."

The climactic fight sequence runs about five minutes and features dozens of CG shots of the Edgar bug duking it out with the two INS agents. Brevig, who doubled as second-unit director, helmed many of the live-action background plates for this skirmish, during which stunt double subbed for actors Smith and Jones. "That was tricky, because we were staging action, and doing shots of Agents J and K reacting to things that weren't there," Brevig says. "It was also time-consuming: we had to make sure the actors knew where to look, because our camera was following the movements of an invisible creature who would only appear onscreen after we completed our CG effects shots."

Among the greatest challenges for Brevig and the ILM crew was Agent J's brawl with the giant space bug. This sequence was developed with a staggering combination of bluescreen photography, miniatures and computer graphics. "After we wrapped photography at the end of July 1996, Will [Smith] came up here for some bluescreen days last October," recalls Brevig. "When you see Will get hit by the Edgar bug or jump on his tail, it's really him; he had to be rigged so that he could be jerked out of the scene and land safely."

Director Barry Sonnenfeld wanted a lot of interaction between the actors and the Edgar bug, so "the camera was constantly moving around this creature as Tommy Lee and Will were attacking him, jumping on him and throwing stuff at him," says Coleman. "When the characters got hit by our creature, we had stuntmen being whipped out of frame on wires, but stunts which looked fast and violent on the set didn't look that good when we put our 3-D character into the scene. The impact of that 12' creature smacking somebody didn't look that powerful, so we had to do a bunch of manipulation [work] in the background

plate to make that read better."

Complicating matters was the fact that ILM had never tried to elicit a performance from a six-legged space bug before. "I had all of the animators study Vincent D'Onofrio, who plays Edgar as a human being, and then we tried to echo certain ticks and twitches," Coleman recalls. "We tried to get emotion out of our creature, but because Edgar was a bug, he had this hard carapace: we couldn't get any expression from his face, so we had to dramatize his increasing anger with body poses."

Apparently, nothing makes this beastly bug angrier than having a human jump onto its back. In order to make actor Will Smith "ride" the nonexistent bug, Brevig constructed a surfboard-sized teeter-totter which matched the dimensions of Edgar's tail. "We built a little bluescreen set where Will could land and be shaken all over the place," details Brevig. "We had four guys manipulating ropes on this teeter-totter, and Will was safety-cabled so he could be flung off it and not hit the ground. Then we chose the best take for performance, animated the bug and tracked the tail section to the teeter-totter, so Will appeared to be barely holding onto its back."

To complete this impressive sequence, the entire creature and Smith were tracked into a miniature set of the 1964 World's Fair location in the Flushing Meadows section of Queens, New York. "That's one of my favorite shots in the picture," Brevig says. "The Edgar bug is about 10' up this big tower, on top of which is this flying saucer. The second Will lands on Edgar's tail, the camera does a huge pullback to the top of the tower, revealing the bug's facial reaction. We tracked that camera move onto Will, then duplicated the move on a miniature background complete with the dirt, grass and the base of this tower. In the end, it just looks like one big backward dolly shot; it's really nice, because everything is tied together." ◆

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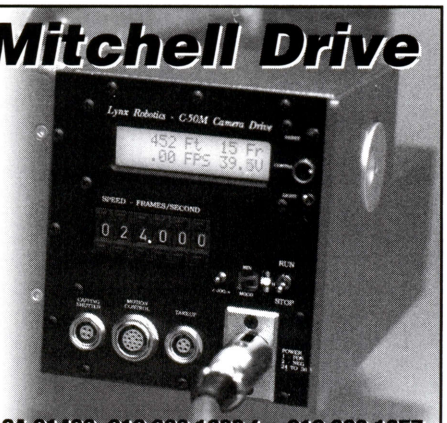
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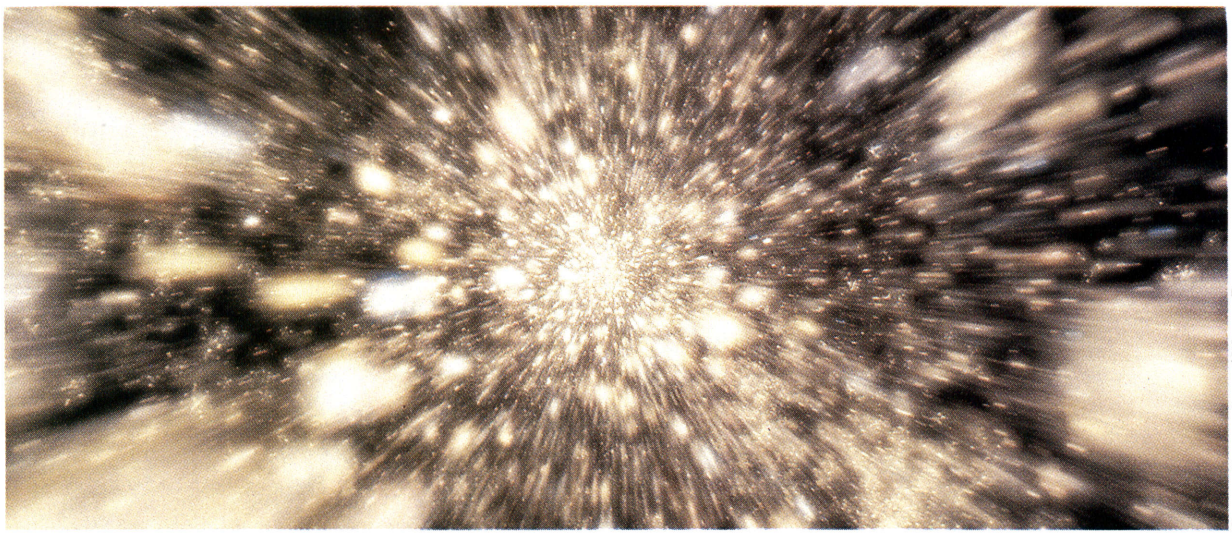
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Cruising the Cosmos

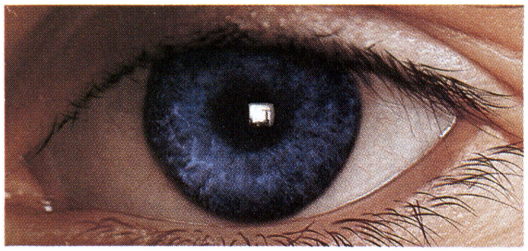
Effects experts help director Robert Zemeckis explore the mysteries of the universe in *Contact*.

by Ron Magid

The galaxy passes before our eyes in a stunning display of the cosmos which is eventually reduced to a glimmering highlight in young Ellie Arroway's eye.

Multi-Oscar-winning effects supervisor Ken Ralston (*Who Framed Roger Rabbit?*, *Forrest Gump*) joined Robert Zemeckis for an unprecedented sixth collaboration on *Contact*, the director's adaptation of Carl Sagan's novel about humanity's first encounter with an alien race (see *AC* July 1997). Most of the effects were handled by Sony Pictures Imageworks, but upon completion of principal photography the number of intended shots had more than doubled; as a result, some of the effects work was parceled out to ILM, WETA Ltd., CIS and Warner Digital. Assisting Ralston were co-visual effects supervisor Steve Rosenbaum and CG supervisors Jerome Chen and Ron Brinkmann. Chen handled shots involving the atomic-shaped Vegan transport machine, while Brinkmann manned the tiller on the metaphysical celestial journeys that bookend the film.

Topping Brinkmann's workload was the opening image of *Contact*, a celestial fly-by digitally recreated from Ralston's favorite NASA images. The effects crew dubbed this "the ultimate 'powers of 10' shot": amidst a cacophony of radio signals, the camera tears away from Earth, shoots past our solar system and the Milky Way, travels at twice the speed of light through amazing galaxies, and finally explodes into



whiteness with a pullback from the eye of young astronomer Ellie Arroway. Brinkmann, explains, "My sequence supervisor, Jay Redd, is an astronomy buff, so our solar system model was based on lots of reference material. Planets were easy spherical geometry, but we generated many objects using particle systems, including the asteroid belt between Mars and Jupiter and the Oort Cloud, a shell of ice surrounding our solar system. To make sunlight refract off this giant ice belt, our art director, Marty Klein, devised a great little prismatic rainbow effect."

What follows is dead space, punctuated by a few isolated stars and increasingly older radio signals. The perspective then drifts beyond the range of any radio transmissions to encounter one of the most beautiful sights in the cosmos: the Eagle Nebula. The representation of this stellar anomaly, composed of giant golden gas pillars, was based upon images culled from the Hubbell Telescope. Imageworks modeled it using a unique combination of wireframe geometry and particle systems, which completely obscured the hard geometric shapes lying underneath. "The big gas pillars we handbuilt looked like giant multicolored wireframe Cheetos," notes Brinkmann. "We used them to emit particles that would conform to that basic surface, whose color was determined by the objects' texture maps. Since the nebula is a gas cloud surrounding stars, we used lots of tricks to create realistic backlighting, as if those volumes of gases were lit from within, and to convey the sense that there were a bunch of

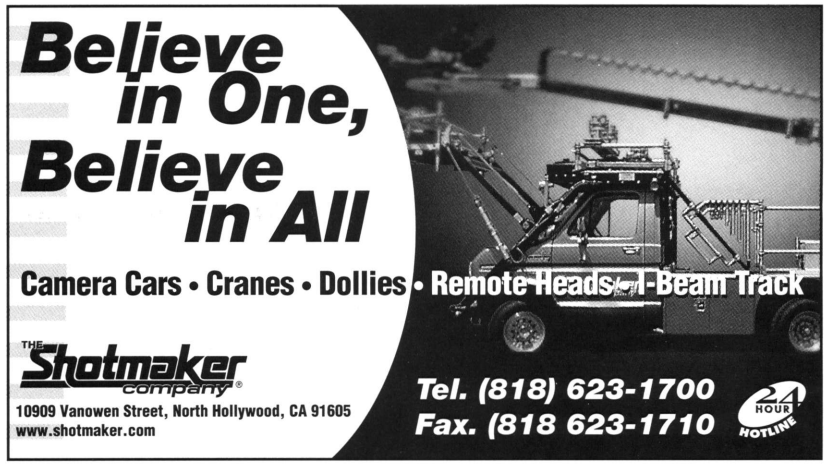
hot stars inside."

As the camera continues its pullback, the Eagle Nebula becomes enmeshed within the spiral arms of the Milky Way. The next sight that comes into view is the entire edge of the spiral galaxy, which Imageworks also modeled using particles systems emanating from geometry.

More galaxies then whiz past, including the Barred Galaxy, so named because of the heavy line of dark matter which bisects it. "At this point in the shot, we're traveling at such tremendous speeds that we're seeing deep field views of the whole cosmos," Brinkmann notes. "All of the little dots are no longer stars, but actually billions of galaxies, which really shows just how huge everything is. A typical cheat would be to make everything really flat and map that onto cards. We developed some code so we could make everything seem more dimensional."

As the galaxies rush swiftly towards the viewer, the image flares into searing whiteness, becoming a highlight in young Ellie's eye as the camera pulls back, revealing her face. Even here, Zemeckis and Ralston had to employ some CG trickery. Reveals Brinkmann, "Rather than doing a flat zoom-out with a camera, we wanted to see a little perspective shift. We modeled a digital eye, including separate eyelashes, based on a reference of the the actress' eye, so they would line up exactly. We used a real blink as the transition."

At 5,000 frames, this awe-inspiring tour of the universe may well be the longest digital shot in a film. As a viewer experiences the sequence, time itself seems to stop, perhaps because the mind cannot fully comprehend the immensity of what is being shown. "It took about eight months to finish, and the whole shot lasts more than three minutes," Brinkmann says with a smile. "We were hoping to give you a sense of how huge the universe is." ◆







Rendering New Worlds

Software developers are busy developing tools that will help to make visual effects even more convincing.

by Jay Holben

(The conclusion of a two-part series which began in AC *Sept. '97.)*

As recently as 15 years ago, Hollywood's visual effects experts were still employing the same basic techniques pioneered in the early 1900s by motion picture legends such as Georges Méliès. But in the 1980s, as desktop computers infiltrated American culture, effects visionaries embraced the growing technology and began exploiting its full potential to improve and expedite visual effects.

Only nine years ago — as the digital revolution began rapidly exerting a strong hold on the world — cinematographer Dean Cundey, ASC was immersed in the effects intricacies of *Who Framed Roger Rabbit?*. At the time, he was still considerably limited by the photochemical optical-printing process needed to combine the live-action photography with classic cel animation. Cundey, who has lent his talents to many of the precedent-setting effects films of the last two decades — such as the *Back to the Future* series, *Jurassic Park*, *Apollo 13*, and *Casper* — is a close follower of the emerging trends in digital technology. "The kinds of films that I enjoy making are ones that take an audience to places where they can't normally go," states Cundey. "Early on, I had the impression that visual effects were done by magicians behind a black curtain. The effects technicians would show up and say, 'You have to do this, you have to do that.' Then they would take the material and disappear. There was a great deal of mystery about what they did. However, as I got more involved [with the visual effects process] on films where there weren't just one or two effects shots, but rather 50 or 100 shots — we had more than *500* effects shots on my most-recent project, *Flubber* — I realized that visual effects were becoming a much more integral part of storytelling. As a result, effects shots are now typically done more by the first unit rather than a visual effects or second unit. Today, it is easier to do more complicated effects on your own home computer then yesterday's effects practitioners had ever dreamed. Visual effects have become much more of a hands-on situation for cinematographers, directors and first units in general. I enjoy the fact that we now have considerably more control over the effects imagery. If you understand the process, and the software being utilized, you can be much more of a collaborator."



Composite images courtesy of Dream Quest Images.

"Shep, the elephant in* George of the Jungle, *thinks he's a dog," explains Paul Jordan, animation supervisor and technical director for Dream Quest. "We couldn't get a live elephant to convey the range of motion required to portray this fallacy — bounding around, panting and wagging its tail — so we worked with digital animation to help the elephant's performance along."

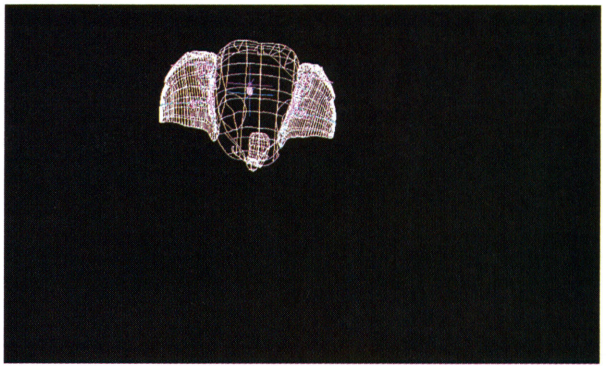
With the continual advancement in Pentium processors and Power Macintosh systems, the Silicon Graphics computers that dominated the effects world just five years ago are now experiencing competition from desktop models, which are bringing the smoke-and-mirror gags of the past into the digital age.

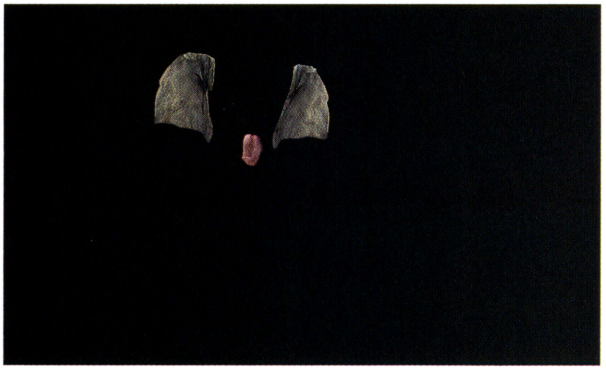
For the direct-to-video feature *Honey, We Shrunk Ourselves*, Cundey stepped out of his usual role as cinematographer and donned the hat of director, hiring longtime camera operator Raymond Stella as his director of photography. To keep up with the deluge of effects shots in the film, Cundey utilized a system whereby temporary composites were made from the dailies to judge the progress of the film's effects. "As a matter of fact," Cundey expounds, "my son Chris, who was the visual effects supervisor, and I set up a temp compositing system in my house with Macs. Using the same software that Dream Quest was using, we composited the show before they did. We'd then give them the pieces and they would do the final."

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The demand for CG effects continues to grow to epic proportions, and software manufacturers are scrambling to meet the needs of the marketplace. As companies expand the palette of their









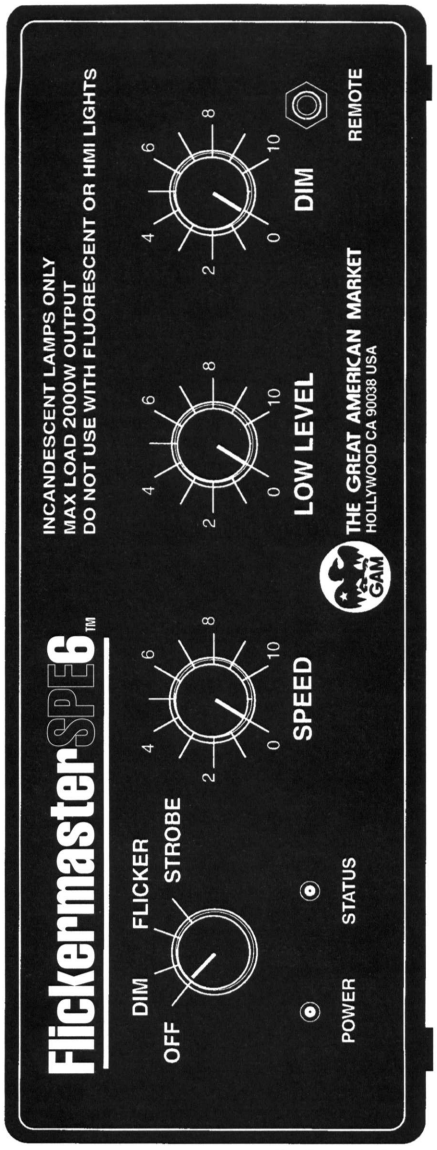
Shep's performance is given a boost with 2½-D CG prosthetics, a plan reminiscent of Rhythm & Hues' Oscar-winning work for* Babe. *Alias/Wavefront's 3-D Studio Paint was used to add surface detail to the additions, while movement was created in Composer.

software, however, some seem to be working within a vacuum: quite often, a company will develop an invaluable application that is not be available on another package which has a different meritorious function.

One firm that has managed to avoid this trap is Side Effects Software, whose Houdini program combines a vast collection of applications in a simplistic and intuitive manner. Established in 1987, Side Effects Software was co-founded by Kim Davidson and Greg Hermanovic with the objective of developing superior 3-D animation software technologies. Side Effects' first endeavor, Prisms, pioneered "procedural animation" in the late Eighties and has since been used in films like *The Fifth Element* and *Independence Day*. Houdini, a "next generation" animation environment, was introduced in September of 1996. The new system boasted an architecture that capitalized on recent hardware advancements; the program's state-of-the-art procedural methodology unifies modeling, animating, lighting, rendering and compositing functions into one package. Continuing in their commitment to offer the most sophisticated and open solutions, Side Effects announced at Siggraph '97 that Houdini is being ported to the Windows NT platform.

Side Effects has already made waves in the digital effects community for its superb collaboration with Sony Pictures Imageworks on the inspired opening sequence for *Contact* (see separate article on page 104). In this epic pullback shot, the viewer is transported past our solar system and into the deepest reaches of space. Jay Redd, animation supervisor and technical director for Imageworks, explains Houdini's role in the striking sequence: "We utilized Houdini extensively for several reasons, one of which is its extraordinary ability to communicate with [Pixar's] Renderman — one of our primary tools, which we used for 95 percent of the sequence. Houdini gave us the ability to keep everything in one environment and to use our own shaders, instead of having to write custom code to allow [our various software programs] to talk to Renderman. Another reason we used Houdini was its particle systems. We used many small particle clouds to create larger ones; the program gave us the power to do 'instancing,' which is used to create one small object and have that automatically 'instance,' or copy, to points around another object, creating something larger without much effort. *Contact*'s opening sequence was made up of millions of spheres. By using what Houdini terms 'expressions' — mathematical descriptions of events that define the way that one object should interpret data from another object — we were able to create an entire galaxy just through expressions, instead of actually having to go through and manually place things."

Contact's opening sequence lasts 4,710 frames — 4,205 of which (approximately 3 ½ minutes' worth) are entirely computer-generated. There are 15,000 lines of shader code and 94 layers of composites, which required over 190 gigabytes of storage space. In fact, one particular frame in the sequence took 18 hours to render. Overall, there are 13 billion generated pixels in the scene and at least 6.5 million particles, a tally which at one point prompted the artists to employ over 125 processors simultaneously. "Texture-mapping was minimal on the opening shot," Redd expands. "In fact, it mostly involved Renderman shading. That was a key issue for us; be-



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cause maps might have made it look flat and lifeless, we didn't go the general route of just painting maps, slapping them on geometry and expecting it to look right. We were flying *through* volumes of clouds, dust, gas and stars. Things that have mass are not the easiest to model or shade, because they require multiple levels of opacity and transparency. That's why the sequence took so long to do, and why it looks [as good as] it does. Houdini gave us the automation to create huge databases of particles in each universe. Everything in Houdini is fully animatable, which is probably my favorite aspect of the software. You can instantly use the digital camera's data of where it is in 3-D space to control another variable. As we pulled back through space, we made a cloud appear to move further from us by using the data of the camera's position to make the cloud become more opaque as the camera moved away. Houdini can take any piece of data from any object, link that to another object, and apply any kind of math formula. It's very powerful and very adaptable, which is great for a technical director."

In the past, many creative types have been stifled by the arduous task of reanimating a sequence that isn't perfect. With traditional cel animation, simply making a character move faster once the animation had been shot was a painfully expensive and time-consuming process that necessitated reshooting and often redrawing cells. Even with all of the advances of digital imagery, making an alteration to a character which has already been created still basically requires rebuilding that character from scratch. However, Houdini offers a true "procedural system" with the unique ability to alter any aspect of a scene — in any phase of creation — with immediate retrograde alterations to the very beginning. "It's a non-destructive process that's similar to non-linear editing," Redd asserts. "I can create a sphere, put an operator beyond that to squash it, put another operator beyond that to cut a chunk out of it, then animate it, twirl it and give it a color. With Houdini, if I need to, I can go back to my original sphere and change it to a square and I instantly have a squished, twirled and colored square with a chunk cut out of it. I don't have to redo those steps again."

Peter Huntzakos, a demo artist for Side Effects, offers an explanation of the procedural paradigm: "Through a series of 'operators,' objects are modeled and animated with SOPs (surface operations), textured with TOPs (texture operations), and composited with COPs (composite operations). These operators are essentially digital 'building blocks' which are connected, in a network, to any other operator. Each operator controls and modifies an aspect of the task you are performing. The parameters of these operators are available to you at any time, so that you can go back and change a parameter in any operator, and everything in your network will update to reflect those changes.

"Houdini takes this one step further with a non-linear, interactive construction. Operators can be inserted, removed or changed at any time without endangering the work that has already been done. It's very much like the difference between a typewriter and a word processor. In the early years, when the typewriter was king and you made an error, you either had to 'white-out' the mistake, or toss out the paper and start from scratch. It's the same with traditional 3-D animation packages — once a model is created and animated, you're stuck with it. With the advent of the word processor, things changed dramatically. You could now cut and paste, undo, redo, edit, then go back and change it again. In Houdini, you can do all of that and much more. Its 'procedural paradigm' and non-linear workflow allow for much more flexibility to re-edit and revise on the fly — which in turn gives you the freedom to be more creative."

For the demanding task of destroying the mid-Wilshire district of Los Angeles for the film *Volcano*, Anders Ericson of Blue Sky/VIFX employed Houdini to add texture to the photographed lava and to "create the edge fires

and smoke on all the lava." He agrees that "the procedural system is obviously Houdini's strong point. It made it easy to create simple animation out of expressions, and to add Renderman shaders. There are no real barriers in Houdini; you can go around things, over them, or through them — you never run into dead ends."

While working with Houdini for director Michael Bay's upcoming picture *Armageddon* (photographed by John Schwartzman, ASC), Black Box Digital's William Robbins has found the procedural system to be an ideal interface for working creatively with the director. "We've had Michael come in several times to look at what we're doing," notes Robbins. "He'll either say, 'Yeah, that's great,' or 'No, that needs a little more.' With Houdini, I can change the parameters of some of the SOPs and instantly show him a different version. We have the ability to go back and forth as often as we need to, in a very short period of time, until he's happy. It saves us a great deal of frustration and effort."

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Before a CG element can be animated, shaded or rendered, it must first be modeled. An effects expert using the modeling process is somewhat akin to a sculptor creating an object out of clay. One of the industry's key tools, especially for modeling, is Alias/Wavefront's Power Animator.

Wayne Kennedy, a modeler for ILM, employed Power Animator to create the horrific shape of the Edgar Bug at the climax of *Men in Black* (see page 102). "Alias has a powerful modeler that is great for sculpting infinite details," he attests. "The Edgar Bug was incredibly detailed — the heaviest model that we've ever had to build. If I really want to do a millimeter of change on an object, I always turn to Alias for those precise measurements and details."

Alias/Wavefront was formed in 1995 when the corporate triad of Silicon Graphics Inc., Alias Research Inc., and Wavefront Technologies Inc. merged into one superpower of digital technology. The company is now a wholly owned and independent subsidiary of SGI. Power Animator is only one of the company's software packages, but it features versatile tools for sophisticated object modeling, character modeling, and animation.

One of the program's phenomenal attributes is the Real World Camera Lens Package, a tool that provides a cinematographer-style interface for adjusting the digital camera characteristics — including focal length, f-stop, lens focus, field of view, and film format. Allowing for complete integration of digital elements with photographed plates, the system also provides a library of pre-defined real-world lenses based on standard optical formulas. This type of software tool has become essential to the industry as filmmakers increasingly merge computer-generated imagery with live-action footage, requiring the accurate matching of digital and optical lens characteristics.

Demonstrating this trend, Dream Quest Images used Power Animator extensively for the creation and integration of a computer-generated elephant with a live-action animal in the Disney family feature *George of the Jungle*. "Shep, the elephant in the film, thinks he's a dog," explains Paul Jordan, animation supervisor and technical director for Dream Quest. "We couldn't get a live elephant to convey the range of motion required to portray this fallacy — bounding around, panting and wagging its tail — so we worked with digital animation to help the elephant's performance along.

"There were two basic families of shots that we did," he continues. "We did a full 3-D elephant, and what we call 2 ½-D — where there was an elephant actor on the set which we enhanced [with CG alterations]. We composited 3-D ears, a tongue and a tail, and then did 2-D morphing effects on the eyes."

To ensure the creation of an authentic elephant, the team hired a practical sculptor who visited Tai, the elephant actress, on the set, and then created a three-foot maquette. The model was strategically cut and digitally scanned; this process produced a 'data

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cloud' — a very dense collection of points from all around the surface of the sculpture, which defines the shape in three dimensions. From there, the "data cloud" was imported into Alias, and modeler Hal Lewis built up the elephant wireframe over the cloud points with NURBS surfaces.

Detailing the exercise, Jordan says, "This began two parallel processes. We took new photographic references of elephant's skin — numerous, mosaic-like close-ups — that were scanned to create a surface detail that was applied to the model with Alias/Wavefront's 3-D Studio Paint. While the texture people were working on that, the model and deformation team worked on the IK (inverse kinematic) skeleton for animation. At the same time, the animators — Bruce Wright, Spencer Leavy, Steward Burris and I — practiced with a lower-res dummy model. We brought that low-res work into the hero model to render the final animation and then, using Alias/Wavefront's Composer, drop the renders into the scene. The final step was to create 'interactive effects,' such as flying dust, mulch, or grass — details that would tie the elephant into the environment shot by [cinematographer] Thomas Ackerman. We did that with Power Animator."

For last summer's dinosaur spectacular *The Lost World,* ILM digital model supervisor Paul Giacoppo worked with a team of modelers and animators to breathe life into director Steven Spielberg's terrifying predators. Working off maquettes designed by visual effects wizard Stan Winston's studio — and in some cases creating the beasts from scratch — the digital team pushed the envelope of visual effects even further than *Jurassic Park* had.

Giacoppo's role as a digital model supervisor placed him in charge of the physical appearance of all the computer-generated dinosaurs. He strove to ensure that they were created correctly, so that the wireframe forms would integrate smoothly with the various other stages of the digital process: animation, painting and lighting. "If the initial model isn't built correctly," he submits, "you can run into a lot of problems later on down the line. At ILM, we tend to build models that are very detailed so that before they are painted, all of those wrinkles and folds — a lot of the major things that you'll actually see animated — will be in the physical model. Once the model is built, it's handed to a view painter who paints all of the surface details and textures, as well as the little nuances that will make it read well.

"We used Alias/Wavefront tools for the initial modeling of the dinosaurs," Giacoppo continues. "We began creating surfaces inside of Alias by taking the scanned data and either projecting curves or just building up the details from scratch. From there, the initial surfaces are created, and there are a lot of tools in Alias which allow you to change the resolution of the patches very easily. You can start out with something very simple and bump it up in resolution to

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make it more detailed as you go. Basically, you start out with a very simple model, rough in the shape, and add in more detail layer by layer.

"The number of points that it takes to make up each creature is very carefully worked out," he adds. "We follow very strong guidelines in order to make our dinosaurs or any of our creatures work really well. Alias is a powerful tool that allows us to change resolutions so that we can insert and control surfaces, and then actually sculpt them to push the points around, display them in different shaded modes and see things shaded in real time. In *The Lost World,* the compy dinosaurs were neat, because they were a creature that viewers hadn't seen in the first *Jurassic* film; they're small, but really deadly. The animators helped give the compies a lot of personality."

One of the considerations in creating models is the CV (control vertices) count. A high CV count will dramatically increase the resolution, but also increase the rendering time. Digital modelers are forced to walk a fine line between the best resolution and the most efficient one. "We did some tricks using Alias that were invaluable for *The Lost World,*" says Giacoppo. "We made very low-resolution compies that were still painted with considerable detail, but rendered in about a third of the time. We were able to mix those in with the higher-resolution models to fill out a scene, from roughly the mid-ground on back. We can create fantastic creatures with the very detailed models that we build, but when they get further from the camera, the details are no longer necessary. The resolution changes offered by Alias let you build up very quickly."

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Digital technology is also opening the doors to many other forms of visual effects. In *Batman and Robin* (see page 100), visual effects supervisors John Dykstra, ASC and Andrew Adamson employed a multiple-camera process called stereo photogrammetry (see *AC* July '97), which mimics the viewpoint of the human eye to create a 3-D image.

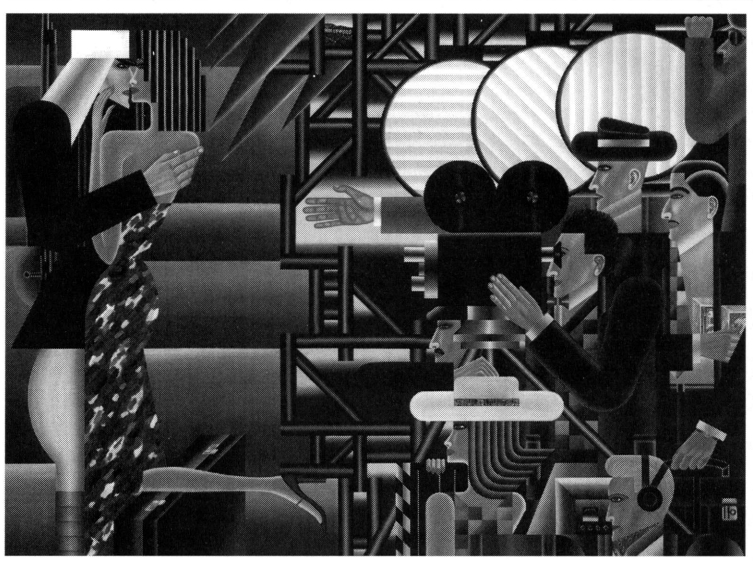
In the film, the sinister Mr. Freeze (Arnold Schwarzenegger) captures his victims by freezing them with a blast of ice. David Stump, the film's visual effects cinematographer, recalls, "We usually tried to do the freezing sequences with moving shots, so that you could see the ice forming during the shot." Working to free the camera to move as the ice formed, Dykstra and Adamson decided that stereo photogrammetry would be the best way to achieve the effect. "It is kind of new technology," expands Adamson. "But recently, there have been some people who are starting to experiment with it. The team at Warner Digital created their own proprietary software to take the information from the multiple cameras and combine that into a single 3-D model. It's basically the opposite of tracking a non motion-controlled camera inside the computer. Instead of using

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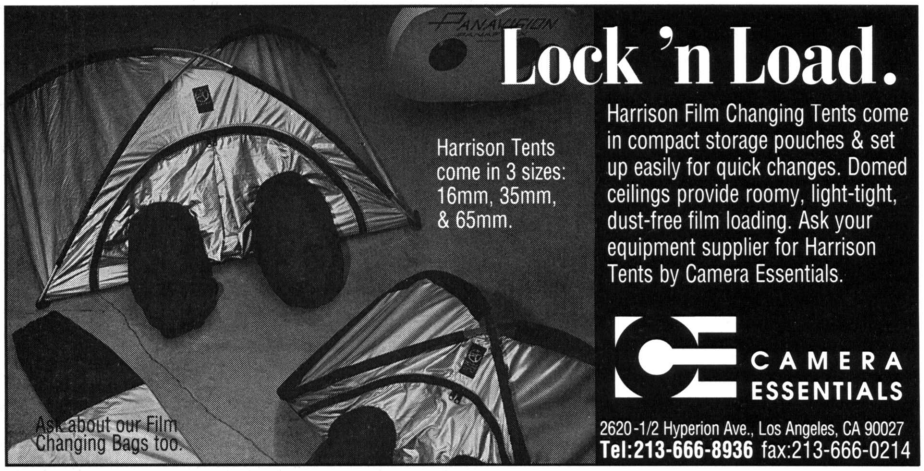
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points within the scene to reference the horizon location, we measure where those points are on the set and then use that information to figure out where the camera is in 3-D space. We would go out to the set with surveyor's transits, and mark the positions of each camera before we shot the scenes. The computer would then take that information and, by using specific points on each model, map out a three-dimensional character of each actor."

Once a 3-D model of a frozen character was built within the computer, digital artists used the Alias/Wavefront platform to shape and animate the ice itself. By creating a 3-D model of the character to be frozen, digital animators were given the ammunition to create realistic reflections and refractions of set elements in the ice blocks, adding authenticity to the frosty situations.

Adamson observes, "A lot of what's now happening with digital technologies is due to the fact that computers are so much faster. Many of the techniques that have just been touched upon over the past few years are suddenly becoming viable."

Pondering this new landscape of digital effects, Dean Cundey offers some words to the wise: "I think that it behooves anyone who works in film now — let alone visual effects — to really study and learn what the software does. It is very important to understand the parameters of the software: what you should and shouldn't do, and how you can help out the process. The work is becoming less and less about the really spectacular shots, although they certainly count as well. CG is becoming a tool that anybody can use to enhance an image. You can now place lights that are needed for a particular effect right in the shot, and then paint them out later. You can erase telephone poles and TV antennas without actually having to take them down. You can even enhance the sky by adding clouds in or creating a sunset. All of the stuff that you always wished you could do as a cinematographer is now possible." ◆

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The 22nd Toronto Film Festival presents a potpourri of intriguing motion pictures.

by Andrew O. Thompson

In keeping with the multicultural tradition of Canada's most-populated metropolis, the 22nd annual Toronto International Film Festival (held from September 4-13) canvassed a rather wide array of world cinema. Opening this year's event was *The Sweet Hereafter* (see Production Slate, this issue), an adaptation of the Russell Banks novel directed by Canadian auteur Atom Egoyan; the centerpiece of the festival's closing night was Jean Jacques Annaud's *Seven Years in Tibet* (see story on ASC's web site).

Aside from gala events and special presentations, the festival's 279 films (culled from some 58 nations) were arranged in the following categories: Masters (a new series featuring new or unseen work from highly respected filmmakers); Contemporary World Cinema; Perspective Canada; Planet Africa (fare from the black diaspora); Discovery (first-time filmmakers); the Real to Reel documentary series; Midnight Madness (bizarre genre entries); Dialogues: Talking with Pictures (in which a moviemaker discusses a favorite film); the national cinema series Balkan Cinema: Home Truths; and a Spotlight series on famed French filmmaker Benoît Jacquot.

This reporter found that the following films — *Regeneration*, *The Life of Stuff* and *Insomnia* — offered some of the festival's most interesting cinematography.

Regeneration
(Scotland/Canada)
Director:
Gillies MacKinnon
Cinematographer:
Glen MacPherson, CSC

While shooting the World War I period piece *Regeneration*, director of photography Glen MacPherson, CSC found himself in a field outside of Glasgow trudging through three feet of clammy mud littered with fake corpses. Making matters even more surreal for the Vancouver-based cameraman was the fact that he was the lone Canadian amid a crew of Scots.

Directed by acclaimed Scottish filmmaker Gillies MacKinnon (*The Playboys*, *Small Faces*, *Trojan Eddie*), the $4 million *Regeneration* adapts Pat Barker's award-winning novel about three soldiers who undergo treatment for psychic traumas brought about by their shell-shocking war experiences.

Besides studying 50 or so war films with MacKinnon — including Ed Zwick's *Glory* and Russian filmmaker Elem Klimov's *Come and See* — the cinematographer's aesthetic references for the combat footage consisted of a collage of actual wartime photographs. Recalls MacPherson, "[In the production office], Gillies had photos on the wall of soldiers smoking cigarettes and drinking cups of tea amid layers of death: fresh corpses on top of half-buried ones; skulls embedded in mud, people floating in the water — just unbelievable destruction and devastation everywhere. And these guys lived in that





Photos by Alan Wylie, courtesy of Norstar Entertainment

Above: ***A hapless prisoner-of-war languishes during one of the many "magic hour" scenes shot on location near Airdrie, Scotland for the WWI film*** **Regeneration. Center:** ***Soon-to-be shell-shocked soldier Billy Prior (Johnny Lee Miller) leads his troops through a battlefield of death.***

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for years. That feeling was the soul of the film."

Indeed, *Regeneration*'s opening shot — which the director dubbed "the Garden of Death" — is a languid overhead pan of a dismal war-torn wasteland. MacPherson executed this sweeping 18mm shot with a Moviecam compact on a remote head attached to a 35' crane arm; this rig was placed on a large platform (112' long, 16' high, and 12' wide) situated above the mire.

Because the film was a coproduction, MacPherson had to preorder Kodak stock prior to leaving Canada for *Regeneration*'s six-week shoot, which commenced in November of 1996. "I had grandiose plans of shooting the war footage on EXR 5245 to get really deep rich blacks and saturated colors," MacPherson relates. "I had 45, 48, 93 and 79 shipped over, but [in Scotland during the winter] you don't have any light until 10:30 a.m., and by 2:30 it's gone. In addition, the sun was always about 20 degrees off the horizon; when I saw [*Regeneration*] with a friend, he asked if I had shot the entire film at magic hour. After two days of production, we shipped the 45 and 48 back, because there was no way they would have worked."

MacPherson actually captured "the Garden of Death" scene at a much darker exposure than intended, due to the director's hands-on enthusiasm. "At about 7 a.m., Gillies was out there with his shovel — and 60 other people — placing bodies, debris, and burnt-out tree stumps across this landscape. As per my plan, I had loaded the camera with the slow stock. But Gillies kept digging until about 2 in the afternoon, so I removed the 48 and put on 93. He kept right on digging, so I took off the 93 and put on 79. By the time we shot, it was 3 p.m.; I literally had to pull him out of there by the collar! I pushed the 79 one stop while wide open, which is a little extreme for a day exterior, but it worked out really well because the light was incredible."

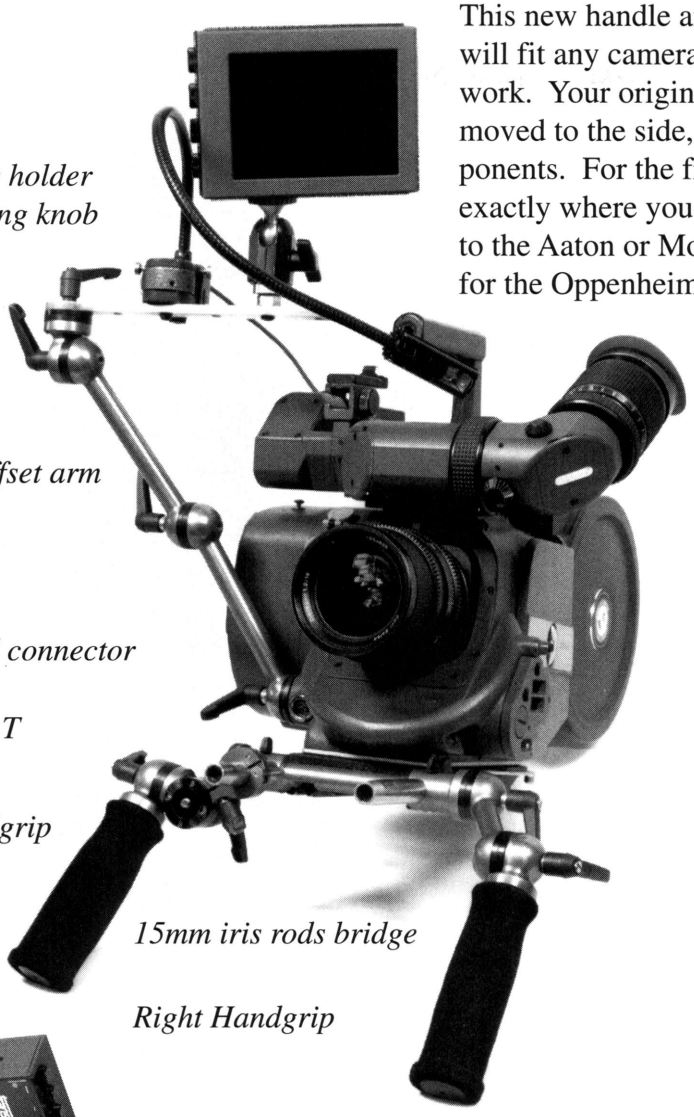
The director did want a visual differentiation for war footage that would appear via flashbacks. One such remembrance occurs when Dr. William Rivers (Jonathan Pryce) hypnotizes Billy Prior (*Trainspotting*'s Johnny Lee Miller), who recalls leading a phalanx of soldier into a barrage of relentless gunfire — only to be left as one of the last men standing. This horrific incident is enhanced by a steel-blue tint that drains any hint of life from the soldiers' skin tones. Macpherson explains, "Gillies liked the desaturated and colorless quality of the flashbacks in *Breaking the Waves* [shot by Robby Müller, BVK]. And I recalled a hockey movie I had shot years ago in an arena lit with mercury-vapor lights, which have a heavy green spike. [To offset this green shift], I would have needed about three generators' worth of lights in the arena. The producers on that film asked me to shoot tests with the mercury-vapor lights to see if the lab could just correct the look back; they did get some of the green out, but since there was no red information, the players' lips went purple and their skin tones got really pasty — it just looked awful."

For the *Regeneration* flashbacks, MacPherson deliberately produced a similar look by placing a Lee 322 Soft Green gel on the lens and then having the footage corrected to normal at London's Rank Labs. "I lost about two stops of light [through the gels]. We had these fragile frames made for the gels, and we were up to our knees in the mud; we couldn't wipe the specks of mud off the gels without scratching them, so we had a guy making green gels all day long! I ended up getting an even more pronounced effect than I had in the hockey movie test, but because there was so much red [information] in the printing, red fringing appeared around the trees in the background."

Scenes set in a military hospital were photographed at Dumbartonshire's massive Overtoun House (although interior shots of the patients' rooms were shot in a Glasgow studio). The structure's derelict innards were renovated by MacKinnon's frequent collaborator, production designer Andy Harris. MacPherson devised darkened hospital interiors to add to the film's oppressive tone. For added blue enhancement, he shot all day-

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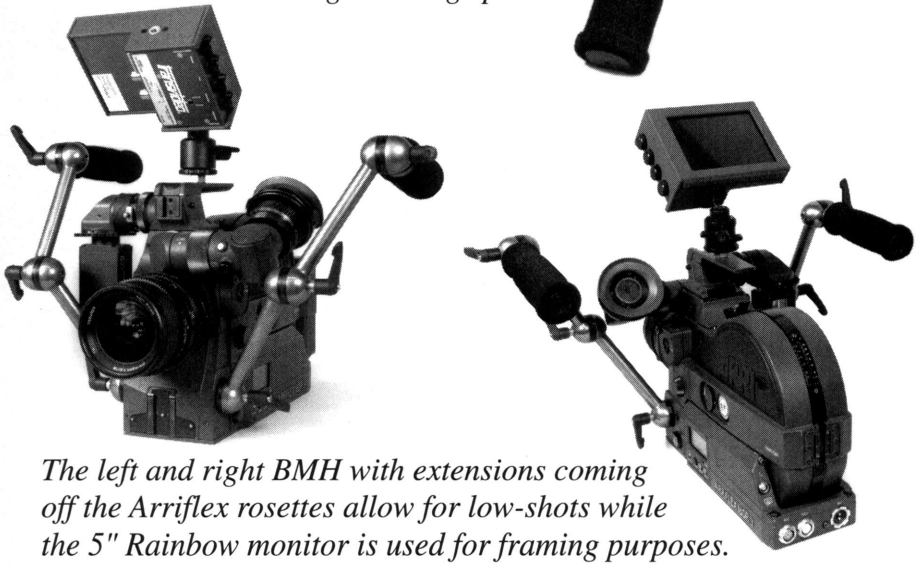
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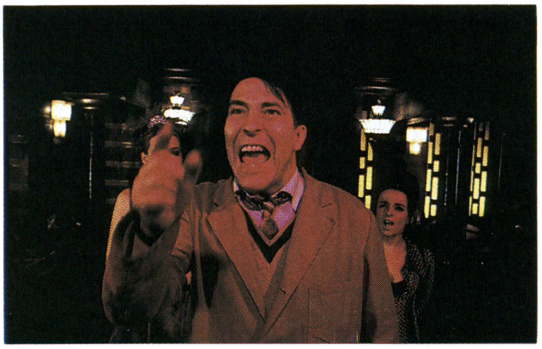


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Photos by Charlie Crawford, courtesy of The Sales Company

Top: ***Crazed custodian Davey Arbogast (Ciaran Hinds) lets loose with wild abandon in the scarlet-suffused party space of*** **The Life of Stuff,** ***a film shot almost solely within an abandoned bakery in Glasgow, Scotland.***
Bottom: ***Club kid Fraser (Ewen Bremner) and drug-hooked whore Janice (Gina McKee) effect an escape in the warehouse elevator, a space in which cameraman Brian Tufano took cues from the work of film noir master John Alton.***

light-balanced interiors/exteriors with an 812 filter instead of an 85, and then had Deluxe Toronto color-timer Chris Hinton push the film's footage even more toward the indigo side.

The naturalistic ambience of Craiglockhart's lighting resulted from small pools of amber ambiance set against dark blue walls. Since the film occurs in 1917 — the advent of the Electric Age — practical sources consisted of either oil lamps or transparent low-wattage bulbs; augmenting the practicals were a slew of fixtures known in Scottish crew lingo as "pups" (1K) and "kittens" (500W). "There was never a dominant source," says the cinematographer. "Even in the daytime, there were just hints of a cool, low-level light coming through the windows [via an Aurasoft source]. To provide some contrast to this daylight, we always had some warm practicals on — such as the desk lamp in Dr. Rivers' office. But I still kept things dark, because in real life those lights weren't very powerful."

MacPherson recently completed filming of *The Real Howard Spitz*, a film helmed by noted British commercial director Vadim Jean.

The Life of Stuff
(United Kingdom)
Director:
Simon Donald
Cinematographer:
Brian Tufano, BSC

English cameraman Brian Tufano, BSC (*Quadrophenia, Shallow Grave, Trainspotting, A Life Less Ordinary*) recently indulged his fondness for collaborating with first-time filmmakers on the bizarre dark comedy *The Life of Stuff*, which is based on Scottish director Simon Donald's stage play of the same name.

The $3.5 million production was photographed mainly within one space — Glasgow's abandoned, four-floor Bilsland bakery — which doubles as a warehouse bought by gangster wannabe Willie Dobie (Jason Flemyng). Having engineered the murder of his rival, Mad Alec Sneddon (Liam Cunningham), Dobie now assumes that he has usurped the drug world. He convenes a crew of lowlifes to refurbish the gutted edifice, and then join in his dope-driven debauchery. Included among this motley bunch are deranged janitor Davey Arbogast (Ciaran Hinds); habitually high harlot Janice (Gina McKee); and anemic club maven Fraser (*Trainspotting*'s Ewen Bremner). With narcotics fueling everyone's insecurity and insanity, Dobie's delusions soon crumble, particularly when someone later arrives to avenge the killing of Mad Alec.

Each level of the warehouse had its own specific palette: the dank, dungeon-like basement is illuminated intermittently with spotty pools of white light; the spacious "abbatoir" level (save for its amber-hued entrance) is bathed in deep blue and tinged with a moonlight effect; an Egyptian-styled party room is suffused with ripe reds and burnished golds; and the roof is also bathed in "moonlight" created with a 12K HMI. "We wanted the sense that the light was unstable, and breaking away in the odd place," comments Donald. "I didn't want to root our location in the Nineties in a precise city of Scotland, so the look is slightly off-kilter. This self-contained world is also slightly dreamy, because everyone is ingesting what we refer to simply as 'the love drug.'"

In keeping with the film's offbeat aesthetic, extreme camera angles — high, low, dutched and otherwise tweaked — are frequently employed, in a purely instinctive style devised by Donald and Tufano on the set. During the films's 30-day shoot, the cinematographer utilized his two favored cameras: an Arriflex BL-4S for scenes with lots of dialogue, and an Aaton 35-III for shots which were handheld, required a fluid flow, or occurred within confined spaces.

Tufano's preproduction survey of the multi-tiered space made him recall the visuals of famed noir cinematographer John Alton. When interviewed for his work on *Trainspotting* (see *AC* Aug. '97), Tufano mentioned that some of his own work could be considered akin to "noir lighting in color." In *The Life of Stuff*, such a scheme is best conveyed in the basement sequences, which also tested how far Tufano could push Kodak's EXR 5293 stock. In one scene, Janice berates Fraser for having unwittingly murdered Mad Alec, who was trapped in the trunk of a van which Dobie ordered him to set ablaze. The two face each other beneath a China Hat lamp fitted with a 60W bulb. With his facade cracking under Janice's tirade, Fraser backs away from her, fading into blackness; as the conversation continues, the cameraman's shots switch between the two, alternating between light and darkness. Tufano explains, "Getting someone to go into blackness is very difficult to achieve, even with modern stocks and very little light — unless the actor walks a really long way away. In the scene in question, the only light in the area was coming from the China Hat. We started the scene with Gina and Ewen under

the light; then, as the scene developed, Ewen walked away from Gina and the lit area. The camera then tracked back, holding Ewen in the foreground and Gina in the background for a deep two-shot with Ewen in silhouette.

"We then had to do a close-up of Ewen, however, so I had to cheat and find a reason why there would be light on his face. Realistically, after we turned around 180 degrees for a close-up, Ewen should have been in complete blackness. You have to see *something*, though, so we wound up lighting him with the reflected glow from the area in which Gina was standing."

Later on, as Fraser's tension increases, he gyrates spasmodically on top on an oil drum — to demonstrate to Gina his promising future as an exotic dancer — while a lone 100W bulb swings wildly over his head. Tufano says, "There were moments when his face got very hot, moments of normal exposure, and moments when it went dark as he turned away. The tricky part was setting the exposure to maximize the amazing latitude of the 5293 stock so that Ewen's face could go from extremely hot to normal to underexposed, but still have some detail. I had to stretch the 93 [used for all of the film's interiors] to its absolute limits, but it ended up coping beautifully."

Not all of *The Life of Stuff* took place in the erstwhile bakery: the film's opening nightclub scene was actually shot in a Glasgow dancehall. The film opens with Mad Alec delivering a monologue that indicts Dobie's motley crew; throughout this scene, he's being encircled by reflections cast from several rotating disco balls. Director Donald had initially intended to use a lone disco ball, but he opted for multiple orbs after seeing a similar setup in a local venue.

To attain the shimmering effect, Tufano resorted to what he terms "mirror balls-on-a-stick," a variation of the "candles-on-a-stick" tactic he developed in capturing BAFTA-nominated imagery for the BBC period drama *Middlemarch*. "On that film, I stuck a bunch of candles on a C-stand and then moved them around until they reflected in the panels of the room's woodwork," recalls the cameraman. "This time around, I had two to three mirror balls in-camera, and the others were on out-of-frame stands. We bounced some Arri 4K HMI Pars off of them to spread the mirror-ball effect everywhere. The opening scene starts in close on the mirror ball and then cranes down, which was a real nightmare in terms of reflections. We hung Duvateen everywhere to hide the lights aimed at the mirror balls; even the camera was covered in Duvateen."

The director of photography recently lent his skills to *What Rats Won't Do*, a romantic comedy set within the legal world which will be released this spring.

Insomnia
(Norway)
Director:
Erik Skjoldbjaerg
Cinematographer:
Erling
Thurmann-Andersen, FNF

In the psychological thriller *Insomnia*, Jonas Engström (*Breaking the Waves*' Stellan Skarsgard) is a dour, obsessive-compulsive Swedish detective assigned to the Norwegian capital city of Oslo. As the film begins, Engström and his partner, Erik Vik (Sverre Anker Ousdal), are sent to a northern town to investigate a young girl's brutal slaying. The methodical psychopath behind the killing has taken all manner of precautions to eradicate any evidence — even going so far as to dispose of the girl's clothes and wash her hair.

During a botched attempt to trip up the killer, Engström accidentally shoots and kills his partner. The neurotic Swede covers up the incident, pinning it on the girl's murderer. But the butcher becomes privy to this deceit, forcing cop and criminal into an unholy alliance which soon has both confronting personal demons.

Nordic filmmaker Erik Skjoldbjaerg, an alumnus of London's National Film and Television School, helmed his first feature in his hometown of Tromsø to make use of the locale's interesting

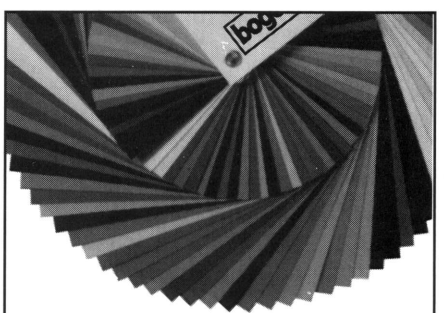
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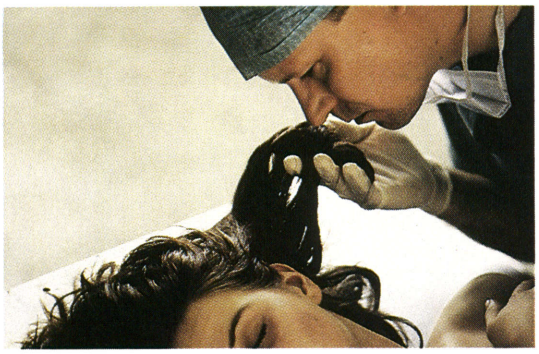
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Photos by Torunn Nielsen, courtesy of Norsk Film

Top: ***Investigator Jonas Engström (Stellan Skarsgard) sniffs the hair of a recent murderee, detecting the scent of shampoo. The haunting prologue of*** **Insomnia** ***depicts the girl's grisly murder in grainy Super 8 images.***
Bottom: ***Engström drags the victim's friend to the garbage dump where the police found the mutilated corpse. The detective is deliberately dressed in muted attire to complement the film's subdued production design.***

illumination; due to its high latitude within the Arctic Circle, this area of northern Norway has 24 hours of daylight during the summer. Skjoldbjaerg and award-winning Norwegian director of photography Erling Thurmann-Andersen, FNF (*Enigma, Shipwrecked, Hard Asphalt* and Best Foreign Film Oscar-nominee *The Pathfinder*) maximized this omnipresent sunlight by devising a style the director describes as "reverse film noir" — hence, protagonist Engström often appears in silhouette. This aesthetic approach offers "an aggressive, nightmarish type of white light" to which the investigator becomes increasingly sensitive as he delves deeper into the murder case. For example, during scenes in which the character is situated before a window (either alone or with a colleague), the pane's blinds seem to burst with brilliance.

The narrative's bleak tone also led the filmmakers to imbue *Insomnia* with a cool blue hue, however. Bright, primary colors were excluded from Eli Bo's muted production design, which was shaded heavily with ochre, brown and baby blue. The film was photographed on Kodak's Vision 500T 5279 stock (sans filters). Low-key lighting was the order of the day; Thurmann-Andersen primarily deployed temperature-balanced daylight sources, such as HMI lamps. Kino Flos and other fluorescent fixtures were used for fill.

Throughout the film, Engström is tormented by sleeplessness. Hoping to obscure the sunlight in his bedroom, the frazzled sleuth shrouds the window with a tarp-like cloth. But each time he tries to sleep, a rip in the fabric allows a beam of white-hot light to fall across his field of vision. The cinematographer effected this stray sunlight with one of his trusty HMI sources. "I set up a 6K HMI outside the set, then bounced it into a mirror and through the hole in the sheet," Thurmann-Andersen explains. "I also used a little smoke inside the set to highlight the ray coming through. It's a simple technique that works very well when you're short of space or you need a cheap effect. I tend to use mirrors a lot because it's a practical way of getting light into places where it's impossible to put a lamp."

Throughout the $2 million production's 6 ½-week schedule (which took place in June and July of last year), Thurmann-Anderson utilized a Moviecam, out of an appreciation for its silence and mobility. Most of the picture's camera moves are quite sedate, but the filmmakers utilized a flurry of frenetic handheld shots during the police's bungled setup scheme to illustrate the high-strung Engström's loss of control.

As the film progresses, Engström is increasingly subject to an erratic emotional state; his growing agitation stems from both his incessant insomnia and his repressed guilt over his partner's death."We didn't want to overemphasize the subtext of repression through the performance, but rather express it through quite subtle camerawork," declares Skjoldbjaerg. "Since the film is really about this main character's journey, we always stay at his eye level. And the sets are clean and simple — flat lighting and flat backgrounds — so that your eyes can never rest comfortably on any one thing. This creates a feeling of claustrophobia and unease.

"We also went for untraditional composition, so that viewers wouldn't focus on the middle of the frame," he continues. "Characters come through the frame in angles that are opposed to accepted film language — leaving left and entering left, instead of leaving left and entering right — especially when the protagonist and antagonist are confronting each other. We wanted to express the idea that the law enforcement and the criminal are almost one and the same."

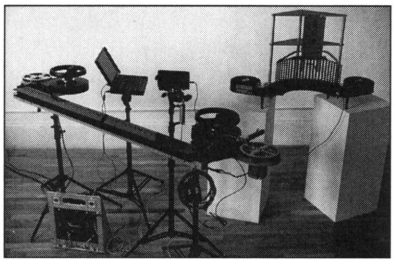
When the psychopath foils the cop's trap, he effects an escape through a hidden underpass, one of the only instances in which darkness prevails in the frame. After discovering this passageway, Engström gives chase with only the extended beam of a flashlight to guide his path. Thurmann-Andersen discloses, "I lit this location — a very short tunnel down here in Oslo — by putting a mirror on the ground and bouncing a 6K HMI into the mirror and down the tunnel, which I then filled up with smoke. I then had Engström run through the tunnel with his flashlight. It was hard to cover up the light and make it sensible, but filling up the tunnel with smoke made it somewhat easier."

Insomnia acquired American distribution through First Run Features and Castle Hill Productions, and will be released stateside sometime in the upcoming spring. Thurmann-Andersen is currently working on *Sancta Simplicitas* in Norway, while Skjoldbjaerg is planning a summer shoot for his sophomore feature, *The Escape Artist*, a dark thriller about five twentysomething kids who emigrate to Spain and soon find themselves embroiled in trouble. ◆

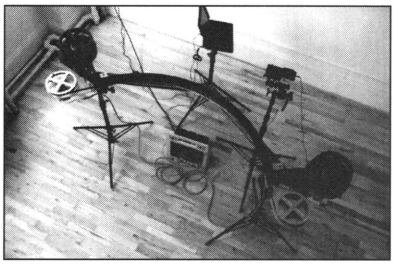
compiled by Andrew O. Thompson

Dayton Taylor Announces Timetrack Visual Effects Camera System

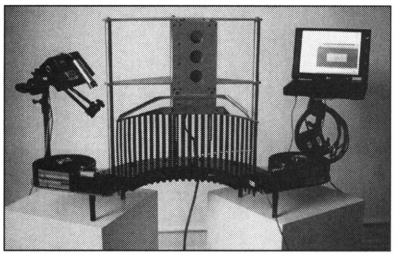
Dayton Taylor, the inventor of a system for producing virtual camera movement with camera arrays (see *AC* Sept. '96) has announced that his company, Digital Air, Inc. of New York, NY, has begun to provide his Timetrack special effect camera systems to the motion picture industry. The patented (U.S. Pat. #5,659,323) Timetrack camera system uses an array of cameras rather than a single moving camera to record "virtual" camera motion. But Taylor's cameras don't actually move during a shot: the illusion of camera motion results from the sequencing of stills taken from an array of fixed positions.



The Timetrack 40-lens straight camera is configured with all of its lens axes perpendicular to the film plane. The camera is five feet long and sectional (additional five-foot sections can be added), shoots 35mm motion picture film (1000' or 400' rolls) and produces VistaVision-compatible negatives measuring 35mm wide x 25mm high. The motion-control-driven shutter system on the 40-lens straight camera progresses through the camera in a linear fashion, allowing for the creation of custom shutter event sequences which combine scenes shot forward-in-time, backward-in-time, and frozen-in-time. Shutter speeds range from bulb to 1/1000 of a second. Frame rate (in sequential mode) can be varied from very slow up to 250 fps. The camera has a sync output for lighting with photo strobes in simultaneous mode, as well as a Unilux sync output for use in sequential mode. F-stops range from F4.5 to F16. (Note: in sequential mode the shutters open sequentially rather than simultaneously, but only one frame is recorded for each lens-position.)



The Timetrack 40-lens curved camera is configured in a 107-degree arc spanning five feet with a 30" radius and lenses that focus and converge at 30". The camera shoots 35mm motion picture film (1000' or 400' rolls) and produces 35mm negatives 35mm wide x 25mm high. The output format of this curved camera is compatible with still film scanning systems such as Photo CD, and it has a usable field of view (the size of the frame) at 20" of approximately 28" wide x 20" high. The Timetrack 40-lens curved camera shares the same shutter system and exposure capabilities as the 40-lens straight camera counterpart.



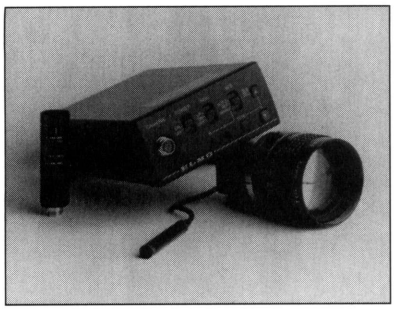
The Timetrack 25 lens curved close-up camera is configured in a 130-degree arc spanning 21" inches with an eight-inch radius and lenses that focus and converge at eight inches. It shoots 35mm motion picture film (400' rolls), produces 35mm negatives 22mm wide by 25mm high and has an output format compatible with still film scanning systems such as Photo CD. This unit's usable field of view (the size of the frame) at eight inches is approximately 5" wide by 5 ½" high. The motion-control-driven shutter system on the Timetrack 25 lens curved close-up camera moves vertically through the camera (see photo), allowing for complex custom shutter sequences to be "programmed" into 25 vertically moving shutter strips. Shutter speeds range from bulb to 1/500 of a second. Frame rate (in sequential mode) can be varied from very slow up to 250 fps. Like the other Timetrack cameras, the 25-lens curved close-up camera has a sync output for lighting with photo strobes in simultaneous mode, as well as a Unilux sync output for use in sequential mode.

All of the Timetrack cameras are presently outfitted with precision-made F4.5 34mm three-element glass multi-coated lenses. Additional information is available from Taylor's web site, at http://www.virtualcamera.com.

Contact: Dayton Taylor — President, Digital Air, Inc.; 231 E. 11th Street, #3R; New York, NY 10003; (212) 477-1639.

Interchangeable MicroCameras

Elmo introduces three new remote-head color cameras, 19 micro lenses and six camera cables. All of these cameras can be individually controlled (singularly) using one CCU (model CC421E) thereby eliminating the extra cost of additional CCU units. This interchange function offers an extremely wide range of applications, including



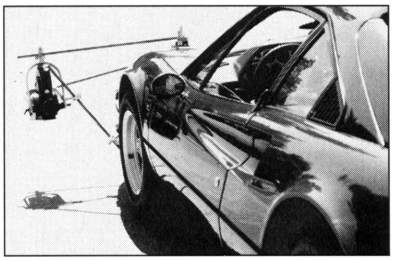
machine vision products, non-destructive testing and inspection, and medical imaging. These cameras also offer vivid color, more than 470TV (H) lines of high-resolution (410,000 pixels), and Digital Signal Processing (DSP) circuitry with on-screen menu display. The new series includes Model QN42H, which weighs 2.4 ounces and has a 7mm diameter with a ¼" CCD and a 3.5mm attached camera cable; Model MN42H, a 17mm lipstick size with a ½" CCD, 5-lux low-light sensitivity, and a camera head that weighs just 0.6 ounces; Model CN42H, a standard C-mount compact unit with a ½" CCD, 3-lux low-light sensitivity, and a 2.8-ounce camera head; and Model CC421E — DSP Camera Control Unit, which accepts the other units' camera heads without readjustment requirements and offers digital signal processing circuitry, a convenient onscreen menu display, and an RS-232C port that allows for remote control of functions.

There are four optional lenses for the QN42H ranging from 2.2mm to 15mm focal length plus a 15mm macro lens for machine vision; the MN42H's seven optional lenses vary from 3mm to 36mm, one 7mm pinhole and seven macro lenses for machine vision. Optional camera cables run in six lengths from 2mm to 30m for the MN42H and the CN42H.

Elmo, (516)775-3200, fax (516) 775-3297, e-mail: elmo@elmocrop.com.

New Mounting System

The Doggimount is a camera mounting system which is used in conjunction with the patent pending lightweight, highly modified Arri IIC. A compact, rigid aluminum framework attaches directly to the sides of the camera body making for one rigid piece; standard ⅝" studs are then threaded into the frame above, behind, and on each side of the frame. These can easily accept the custom clamps provided with the system. The camera can quickly be secured in any point in space by triangulating to these pickup points with the aluminum rods and swivel clamps provided with each package. So far this system has been mounted on a motorcross bike, several bicycles, a Ferrari, a Cadillac Catera and even a skateboard.

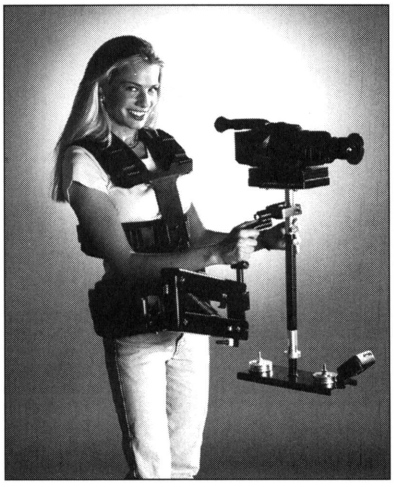


The complete system comes with an assortment of rigging tools to allow flexibility of applications, and is available for rental along with the custom Arri IIC. Added features available for the system include remote follow focus and camera start/stop, black-and-white or color tap, wireless video, PL or Panamount and a lightweight battery pack.

Doggicam, (818) 845-8470, fax (818) 845-8477.

Camera Stabilization System

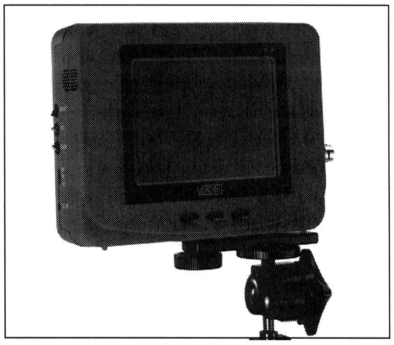
Glidecam Industries now offers its new professional camera stabilizer the Glidecam V-8. With its orbital hinge technology and compact dynaelastic arm, this unit allows for body-mounted camera stabilization to cameras weighing up to 10 pounds. This stabilization system allows one to walk, run, go up and down stairs, shoot from moving vehicles and travel over uneven terrain without any camera instability or shake. The Glidecam is designed primarily for use with lightweight video cameras and 8mm motion picture cameras, and allows for the production of a smooth traveling shots usually achievable only via very heavy cameras with inert stabilization.



Glidecam Industries, Inc. (800) 949-2089, fax (508) 866-5133.

LCD Color Monitor

The Vocas monitor utilizes the latest TFT active matrix technology to provide a wide viewing angle with superior resolution. This four-inch color LCD was designed for broadcast and video-assist applications and is available in either NTSC or PAL. Industry "standard" connectors such as BNC video input and Hirose four-pin DC power input (11.3-24Vdc) are conveniently located on the ABS housing. Other features include internal speaker, earphone jack and controls for brightness, tint and color.

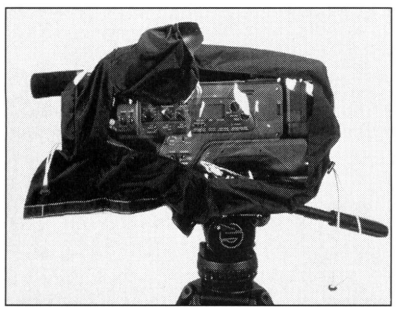


The VLM-400 weighs only 15 ounces and can be attached to any camera handle or stand with its versatile multi-mount. It is supplied with a cordura sunshade, AC power adapter and a detachable battery pack which operates the monitor over four hours with eight AA batteries. This rugged and compact unit is quite shock resistant and can be used in areas of strong magnetic influence and at high altitudes. Additional accessories include a soft cordura carry case, Pelican hard case and custom cables for both video and DC input applications.

ProSource, (203) 335-2000, fax (203) 335-3005.

Camcorder Cover

KATA introduces the new Rain Cover-DV which is designed specifically to shield DVCAM, DVPRO and other simi-

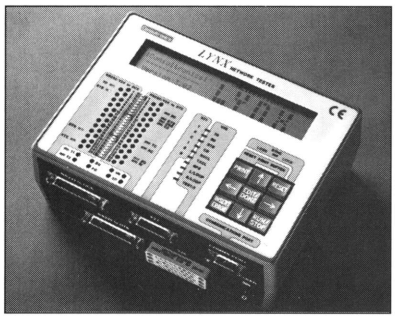


larly-sized camcorders from the adverse effects of foul weather. This sheath is constructed from weatherproof materials and features a clear vinyl panel on the camera's control side. The cover is secured by pulling the fore and aft drawstrings — their sunshine yellow coloring ensures that the strings remain visible even in dim light. Other features include a flexible sleeve with strong elastic cuff to protect the viewfinder and a hook-and-loop bottom seam designed to slip quickly over the camera.

KATA USA, (805)520-4725, fax (805) 520-7342.

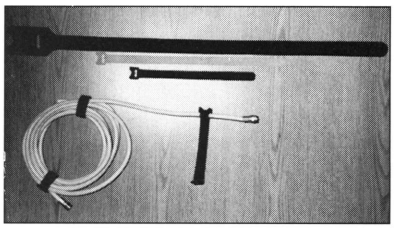
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Consultronics Ltd., (613) 225-6087, fax (613) 225-6315, e-mail: nknudsen@consultronics.com.



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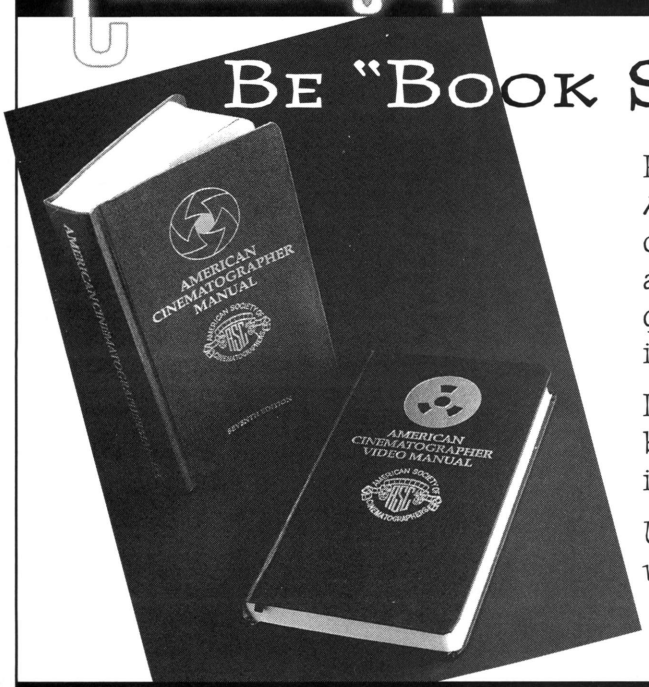
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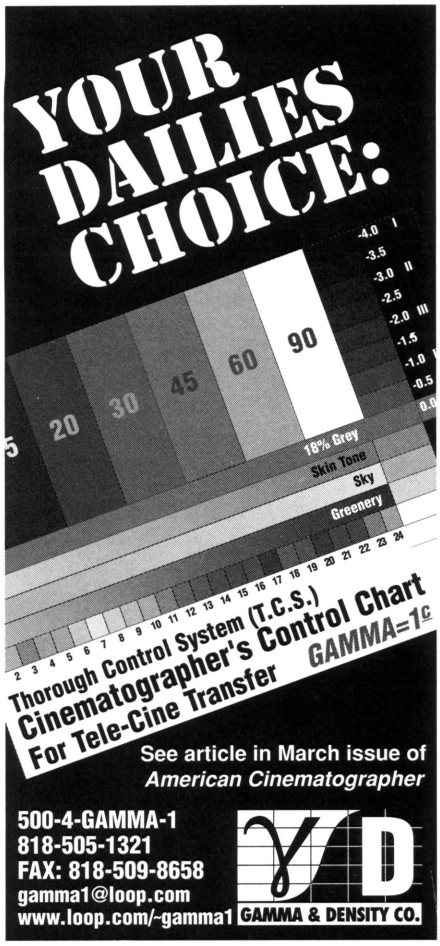
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Iron Man Bulks Up in Kellogg's "Engine Room"

by Mary Hardesty

After their Nutri-Grain cereal commercial, "Engine Room," won a Bronze Lion at Cannes, Kellogg's marketing executives were naturally pleased that they had asked Australian-born director of photography Steve Mason to shoot it. They were even more thrilled when the spot went on to win numerous other advertising prizes, including three Gold Mobius awards and a gold medal at the London International Awards.

A mostly self-trained cinematographer, Mason began working in the Australian film industry just out of high school. He moved up through the ranks quickly, graduating from third AC clapper loader to director of photography on shorts, commercials, small films and documentaries.

"The line 'Iron Man food' has been around for about 20 years, and Kellogg wanted to delve into the theme of Nutri-Grain fueling an Iron Man," explains Mason.

In Australia, Kellogg's Nutri-Grain cereal is the second-highest-selling brand, and the company is keen on keeping sales up. For "Engine Room," the cerealmakers not only budgeted for an unusual three-day shoot, but also allowed Mason to do a series of tests to get a look similar to that of the dreamlike, high-contrast French film *The City of Lost Children,* photographed by Darius Khondji, AFC. "They wanted it to look hip so a younger generation might find it attractive," points out Mason, who used Kodak's 5298 stock for interiors and 5293 for exteriors. "Prior to production, we tested different lab techniques, such as bypassing the bleach. That makes for a really rich black, and takes a bit out of the other colors. Not only does it desaturate the colors, but it adds a great deal of contrast. You have to be careful when using a bleach-bypass process on the neg, though, because it increases the neg grain a bit."

Working closely with writer/director Brian Jones, Mason used camera angles to create a feeling of isolation. "In real life, an Iron Man trains alone," Mason notes. "'Engine Room' is about stoking the engine that burns inside and fuels the body."

The new spot is the second in the Nutri-Grain series. The first, "X-Ray," was shot by Australian cinematographer Lance Kelleher. Notes Mason, "'X-Ray' was about the Nutri-Grain coursing through the Iron Man's veins to reach every part of his body and help him perform the best he could. For the second commercial, Kellogg wanted a more feature-like look."

To facilitate the shoot, a gym was built to resemble the engine room in the hull of a boat. Mason relied heavily on lighting to create a sense of motion in these scenes. "Most of the scenes were tight shots, which made things a bit easier to light," recalls Mason, who achieved the look with numerous Par lights, incandescents with yellow and green gels, and an Arriflex 35-III camera equipped with Zeiss lenses. "We put all of the lights on dimmers, and even had them moving," he adds. "I had a great gaffer, Paul Johnston from Australia, whom I've worked with on other spots as well. We placed two rows of lights on bars hanging down on ropes and swayed them. When combined with the dimming lights, the swaying made it feel as if we were deep down inside a grimy engine room."

To shoot the Iron Man working out in the ocean, Mason and his camera crew placed the camera in an inflatable boat and revved the engine hard to track with the surf. "Most boats just turn over in heavy surf, so we had to use an inflatable one," notes Mason, who hired a specially trained lifeguard to operate the engine in the hazardous waves. "I held

onto my Australian camera operator, Rob Hunter, and Rob held onto the camera, which was tied onto the boat in a waterproof, hard-cased housing. To keep the shots as steady as possible, I used mostly wide-angle lenses — around 21mm and 22mm."

The surf shots were done in Sydney harbor under very rainy conditions. "I wanted to take a weather day, but the agency said 'Don't worry, we'll fix it later in post.' They spent almost two months fiddling with it in post, but Simon Brewster at Garner MacLennan Design in Sydney did manage to get the rain and gloom out of the spot by using Discreet Logic's Flame program."

After honing his skills on Australian commercials and features, Mason moved to the United States three years ago. His recent American feature film credits as a director of photography include *Buddy* and *That Old Feeling.* Mason's next feature, a Showtime made-for-TV movie starring Kiefer Sutherland, will take him to New Zealand. With his impressive list of awards for "Engine Room," Mason has already been asked to photograph the next spot in Kellogg's campaign, which is scheduled to shoot in spring of 1998. ◆

Spot: "Engine Room"
Client: Kellogg's Nutri-Grain Cereal
Director: Brian Jones
Cinematographer: Steve Mason
Agency: J. Walter Thompson
Sydney, Australia
Production Company: Kinomontage, Sydney.
Producer: Janet Stubbings

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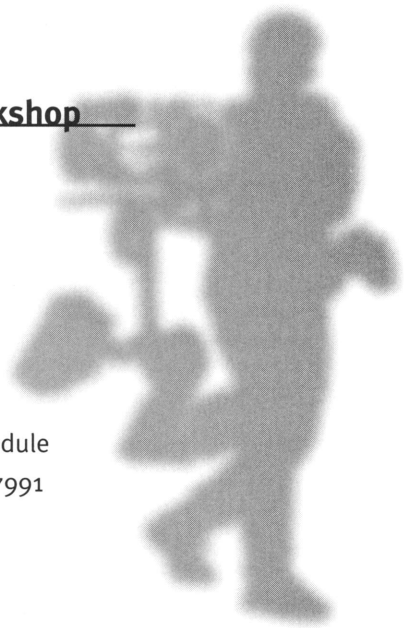


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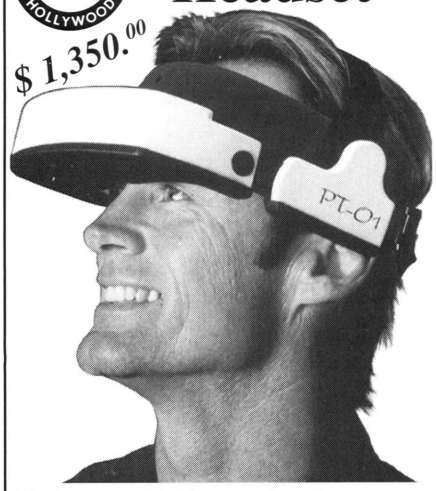
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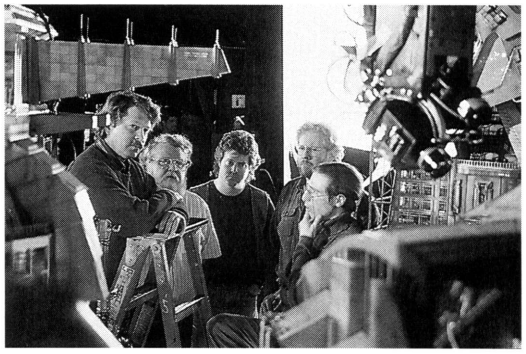
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One would surmise that the largest visual effects house on the East Coast should logically be located in Manhattan's busy Silicon Alley, or in one of the Northeast's burgeoning high-tech corridors. In fact, the leafy, bucolic New England setting of Lenox, Massachusetts, deep in the Berkshire mountains 150 miles due-west of Boston, is home to this top facility, known throughout the industry as Mass.Illusions.

Creating Illusion in Seclusion

by Eric Rudolph

The firm's staffers maintain that they're better off creating cutting-edge computer graphics, miniatures and motion-control work far from the noise and clutter of New York, Los Angeles or even Boston. "Life is less hectic here, and it's easier to focus," says visual effects director Joel Hynek. "There's no horrible traffic, and the surroundings are beautiful. The environment helps ground people in the natural world, which is important to the creative process."



Mass.Illusions staffers ponder their next bit of magic.

As beautiful as the setting is, Hynek concedes that it isn't always easy to lure business to an effects shop in such an out-of-the-way location. "Clients have to overcome the psychological barrier of the 3,000-mile distance from here to Hollywood. We try to reduce the reality of that distance with tightly coordinated, quick turnaround of videotapes, and the use of high-speed T1 and ISDN lines for sending files and for teleconferencing with our clients. Of course, when you analyze it, the time you spend face-to-face with your clients, even if you are in Los Angeles, isn't that great; usually you're on the phone or sending over a tape."

The firm currently has no full-time Hollywood sales representative. Hynek notes, "We're thinking about hiring a salesperson; we just opened a San Francisco-area office at the old Alameda Naval base, which helps us have something of a West Coast presence." The Northern California office was opened this past summer to focus on creating the visual effects for Polygram's upcoming Robin Williams film, *What Dreams May Come.*

To compensate for their unusual location, Mass.Illusions always tries to ensure filmmakers "a look they cannot get elsewhere." Toward that end, the firm often designs the software needed to produce an effect in-house. "It is essential to our existence that potential clients feel they'll get something from us that is just not available at other shops," Hynek says.

A key to creating one-of-a-kind visual effects is what Hynek describes as Mass.Illusions' "unified world environment," a precise, data-focused approach which allows the company to maintain tight coordination and consistency among all aspects of its work, including CG, motion control, models and compositing. Hynek explains, "The very definition of *visual effects,* which are images produced from separately created elements — as opposed to *special effects,* which are things created in front of the camera — means you have to concentrate on the smooth coordination of

all the separate elements. These elements are usually from different cameras, locations or software platforms." To assure the integration of such disparate elements, Mass.Illusions emphasizes pre-visualization, creating a database for each effect that consists of the three-dimensional coordinates of every point on an object. This data is then used as a central reference point for all work involving the object.

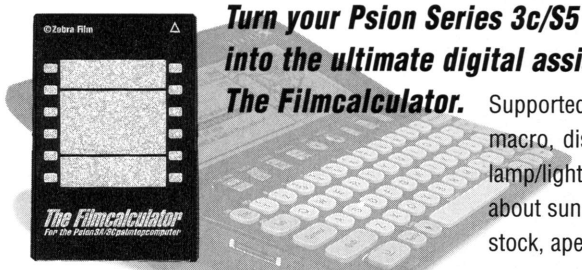
A series of shots of Arnold Schwarzenegger dangling precariously from a flying 727 jetliner in *Eraser* illustrates Mass.Illusions' unified world environment approach. "We had to create the database of the 727 ourselves, because the 727 was designed in the days before all airliner blueprints were created on computers," Hynek says. "Once we had all of that data, though, we used a computer-assisted drawing program to create a CG 727, and computer numerical control to create an exact physical replica that precisely matched the proportions of the CG version. Some shots used the CG 727, some used the actual physical replica we built, and some used both, meshed together. Because both the model and the CG 727 were both generated from exactly the same data, which came directly from the precise dimensions of a real 727, we could guarantee to a great degree that the shots would be seamlessly integrated, and therefore extremely realistic."

The same database information is also used in compositing the various elements into a finished coherent shot. "Using our precise database information, we can convincingly change the lighting or add a realistic reflection map to the underside of a model," Hynek adds. "Those kinds of things are very difficult to do during model photography."

Mass.Illusions was formed in 1994 as a wholly-owned subsidiary of Cinergi Pictures Entertainment Corporation, expressly for the purpose of creating visual effects for two Cinergi films: *Judge Dredd* and *Die Hard With a Vengeance*. Other major films to which the firm has contributed include *Event Horizon, Evita, Starship Troopers* and *The First Wives' Club*. This past September, when Cinergi went private and sold off assets, Mass.Illusions found a partner in the Manex Group, an English corporate finance firm that was willing to share half of the company with its 65 employees. Expansion prompted by the infusion of capital has already begun. A new television commercial division is already working on spots for Burger King and GTE pagers; Tom Gasek, formerly of Aardman Animations, now heads the stop-motion department.

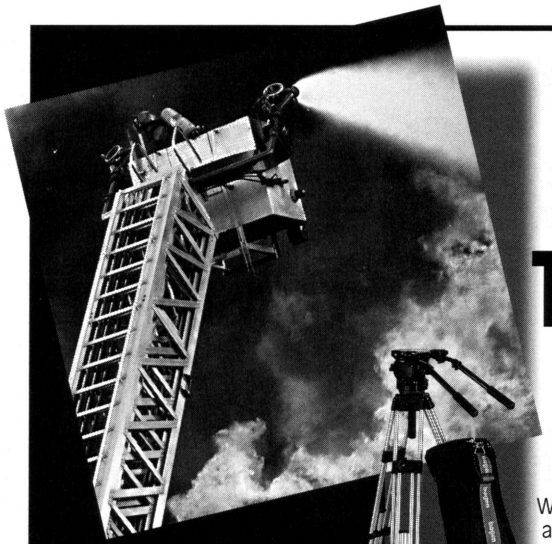
Mass.Illusions is also investing heavily in the emerging and popular field of reality capture, in which tiled 360-degree images of locations are captured and combined with actors in postproduction. The shop recently added a crucial new piece of equipment to their arsenal: a portable laser scanner that produces a "three-dimensional database of everything it sees on location." Hynek concludes, "Eventually, stock footage of this type will be available. You'll be able to order a view of Yellowstone Park taken from a certain point, combine that with an actor filmed on bluescreen, and place the actor quite convincingly in the Yellowstone environment, even using highly fluid handheld camera moves. That's where the effects business is headed, and we feel that we are at the forefront." ◆

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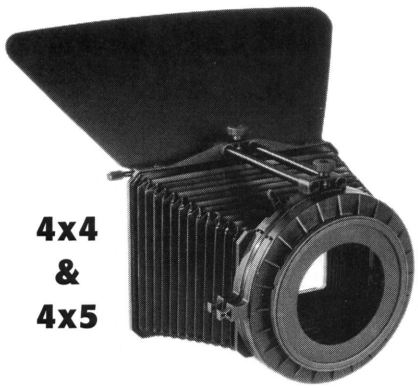


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Books in Review

by George Turner

Pickford — The Woman Who Made Hollywood
by Eileen Whitfield
University Press of Kentucky, 492 pps., cloth, $25

There were years when Mary Pickford was the best-known and most admired woman in the world. There was even more to "America's Sweetheart" than that. She was a movie star and producer, a co-founder of United Artists, and, in her day, the highest-paid actress in history. In this exhaustive biography, a journalist from Pickford's birthplace, Toronto, offers a three-dimensional view of the person who, if she never actually "made" Hollywood, certainly played an important part in making it the movie capital.

Gladys Louise Smith, born in the spring of 1892, became a vaudeville trouper at the age of nine, and was on the road until she was 15. She then met Broadway impresario David Belasco, who dubbed her Mary Pickford and gave her a role in *The Warrens of Virginia.* Seeking financial security, she swallowed her pride and, with sister Lottie and brother Jack, went to work at Biograph Studio for $5 per day. Her mentor was D. W. Griffith, one of the better directors of the time. In 1909-10 she made 85 one-reelers for Biograph. There was no star system then, but she became popular as "the Girl with the Curls." Three years later she was starring in features like *In the Bishop's Carriage,* and in 1916 she got a two-year contract at Paramount paying her $1 million.

After divorcing Owen Moore, whom she had married in 1910, she married the dashing Douglas Fairbanks. Soon the glamorous pair owned their own Hollywood studio on Santa Monica Blvd. In 1921 she and Fairbanks joined D. W. Griffith and Charlie Chaplin in establishing United Artists.

The arrival of talking pictures signalled the end of the careers of both stars, and divorce eventually shattered the idyllic marriage. Mary Pickford never really recovered from either debacle and even her fiercely dedicated third husband, Buddy Rogers, couldn't save her from despair.

This excellent biography is a story of personal triumph and downfall on an epic scale, with a protagonist as regal and doomed as the central figure in a Shakespearean tragedy.

The Films of Michael Powell and the Archers
by Scott Salwolke
Scarecrow, 272 pps., cloth, $39.50

The Archers were the team of producer/director Michael Powell and producer/writer Emeric Pressburger. Salwolke concentrates upon Powell, giving a once-over-lightly of his early apprentice work in France and England, his years as a director of "quota quickies" in the early 1930s and his graduation to bigger pictures. He then focuses on the heady years of The Archers (1942-1957) and the later films. He notes rightly that Powell's best work was done in collaboration with Pressburger.

There is a modicum of biographical material, which has already been detailed in Powell's massive 1,250-page autobiography. The real concern is the movies themselves and the thinking that went into them. The Archers productions began with *One of Our Aircraft is Missing* and includes *The Invaders, Stairway to Heaven, Black Narcissus* and the immensely popular *The Red Shoes.* Also well-reported is the tragedy of *Peeping Tom,* the controversial film that wrecked Powell's career in England, and there is some interesting information about the lesser-known pictures he made in Australia late in his career.

It is difficult to understand why most of these remarkable pictures did not receive the recognition they deserved. The author believes it was because they broke with both major trends

of the British cinema, the documentary approach and the literary tradition, which put them out of step with critics and the industry.

It's great to see Powell receiving his due, and this is a welcome addition to the literature of his very special talents.

From Oz to E. T.
by Wallace Worsley and Sue Dwiggins Worsley edited by Charles Ziarko
Scarecrow, 288 pps., cloth, $36

Thousands of great yarns about filmmaking have gone unheard because those who could have told them aren't stars or directors. Once in a very great while one of the professionals from outside the Pantheon is able to step into the spotlight and offer some refreshingly different views of Hollywood history.

Wally Worsley died in 1991. This posthumous memoir, completed by his wife and a co-worker, chronicles his 50 years in the studios. He started as a messenger boy at MGM in the early 1930s, graduated to script clerk on big pictures such as *After the Thin Man, San Francisco* and *The Wizard of Oz,* and became an assistant director on some top dramatic features and several of the big Arthur Freed musicals. In 1948 he left MGM to make documentaries, direct a TV series in Germany, and outrun the spectre of starvation in Europe. He returned in 1960 to a less colorful Hollywood dominated by television production, but soon found an exciting new career at Universal as a production manager and as a major force in establishing the Assistant Director Training Program for the DGA.

Anecdotes abound — odd, infuriating and funny ones, featuring W. S. Van Dyke, Marlon Brando, Peter Sellers, Alfred Hitchcock, Steven Spielberg, L.B. Mayer, Wallace Beery, Marion Davies, Mervyn LeRoy and a big cast. Several cinematographers are among the movie people receiving accolades or brickbats. It all makes for good reading about Hollywood at work.

Worsley's father was the Wallace Worsley who directed the silent classics *The Penalty* and *The Hunchback of Notre Dame* before he made the mistake of angering a studio chief. ◆







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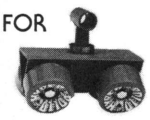
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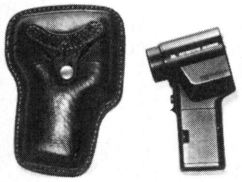
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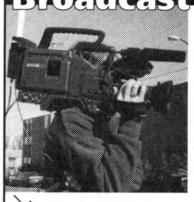


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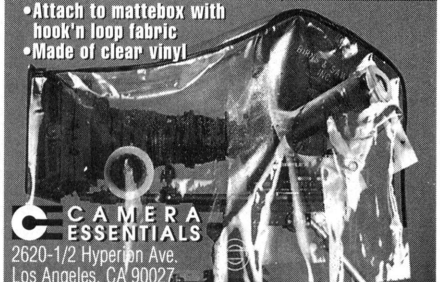
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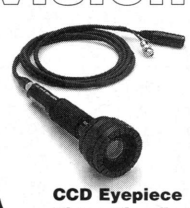
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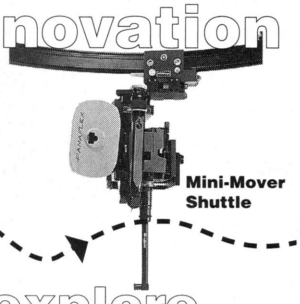
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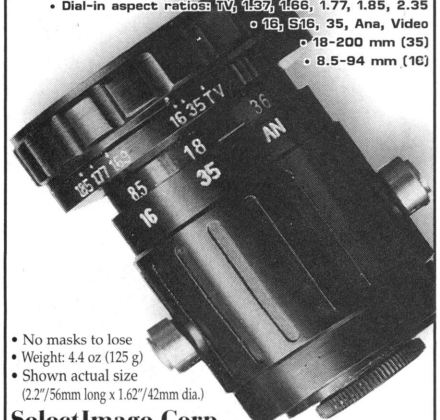
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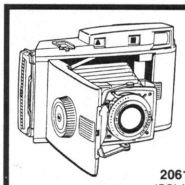
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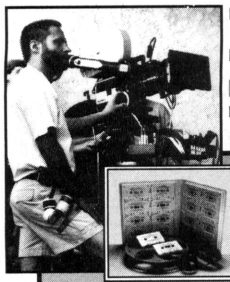
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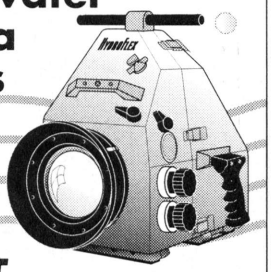
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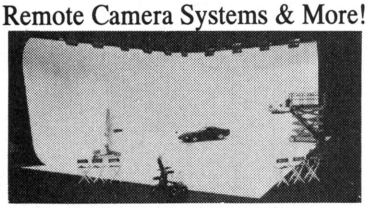


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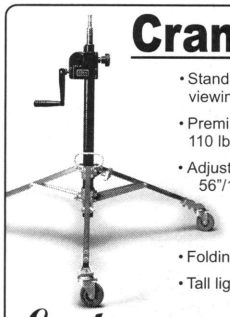


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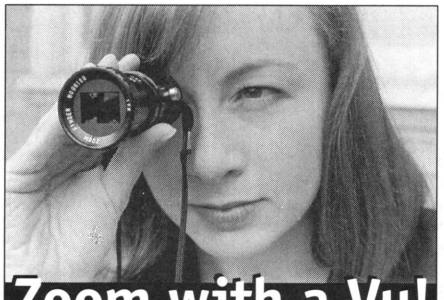
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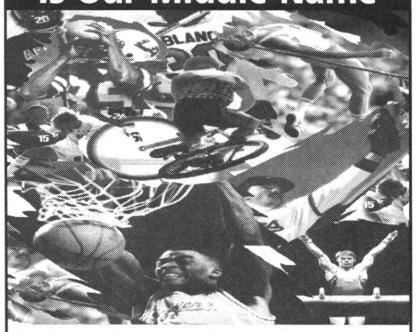
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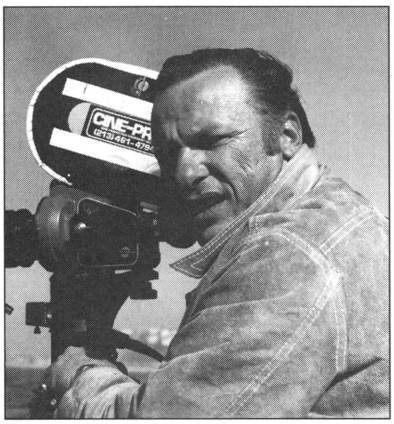
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In Memoriam



Robert H. Caramico, ASC, a former combat cameraman who became a distinguished Hollywood cinematographer, died on October 18 after a long battle against cancer. He was 64 and had been an ASC member since February 3, 1981.

Caramico was born in New York City on December 10, 1932. Orphaned as a child, he joined the U.S. Marine Corps when he was 17 and served for six years (1949-1955), including five years as a combat cameraman. He was wounded in Korea and hospitalized for a year. He was also captured and imprisoned in a secret "no-name" camp, whose inmates were slated to "disappear." He escaped nine months later. After leaving the Marines, he became a news cameraman for INS and was stationed in Israel for eight months. Caramico was reported killed along with several others when their truck hit a land mine, but he had jumped off before the explosion.

Late in 1956, Caramico returned to New York and entered the visual effects field. "From 1955 to 1975 I worked in all phases of motion pictures, including stop-motion photography, animation, optical effects and live-action photography," he said. He also photographed many commercials.

In 1964, he came to the West Coast and worked on many features, TV specials and pilots as a director of photography. His early work in Hollywood included *The Freddie Prinze Story, Journey to the Center of Time, Black Rider, Lamora, Octaman, Spawn of Slithis, The Doberman Gang, The Daring Dobermans, The Manhandlers, Willie, No Way Back* and others. In February of 1975 he became a member of IATSE Local 659.

His later features include *Mean Johnny Barrows, Adios Amigos, The Starlite Murders, Slumber Party '57, Joshua, Death Journey,* and *The Happy Hooker Goes to Washington.* In 1978 he began specializing in TV pilots and movies of the week for most of the major producers. His pilots include *919 Fifth Avenue, Gumshoe, Tom Swift/Linda Craig, Indians* and *Landon, Landon and Landon.* MOWs include *Kiss Meets the Phantom, Topper, The Love Tapes, Rape and Marriage,* and *Washington Mistress.* He won high praise for his work on Universal's miniseries *Beggarman, Thief.*

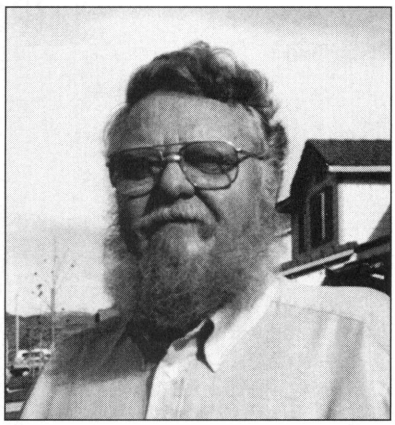
Although he preferred making features and pilots, Caramico sometimes returned to TV series productions, most notably for full seasons of *Dallas* and *Falcon Crest* and 43 episodes of *Lou Grant.* Other series he worked on were *Skag, Never Say Never, The Waltons, Whiz Kids, Second Half* and *Lassie.*

Last year, although he was undergoing chemotherapy, he filmed the *Boston Common* series for Castle Rock. "When you love what you do you never quit," he said when asked about retirement. This year he was photographing the series *Just Shoot Me* at CBS Studio City. Although he had to work in a wheelchair, he continued with the series until Thursday, October 16. "I won't be able to go in tomorrow," he said that night. He passed away two days later.

Executive Producer Steve Levitan said that "Bob was an inspiration to us all. We'd come in mornings with headaches or something and there he would be in his wheelchair, hard at work. When we saw him, we had no problems at all."

Bob Caramico is survived by his wife, Dianna, of Canyon Country, California; a son, Joseph, a sister and a grandson. Donations to his memory may be made to the Humane Society or the Motion Picture and Television Fund and Foundation. A Memorial Service was held on Saturday, November 1, at the ASC Clubhouse. ◆

In Memoriam



David K. Stewart, ASC, a leading visual effects director of photography, died on October 16, at the age of 60. He had devoted more than half his life making motion pictures.

Stewart was born in Jeffersonville, Indiana, August 27, 1937. He became an active member of the ASC in 1984. He entered the field in 1966 as an assistant cameraman at Dickson-Vasu Camera Service in Hollywood, operating an Oxberry camera stand. The "down-shooter" camera stands were utilized for the production of animated films, main titles, rotoscoping and traveling mattes.

In 1971, Stewart began working for Robert Abel Films, a Hollywood company whose innovative commercials and visual effects were gaining widespread attention. For the next five years he was involved in the design and photography of commercials utilizing sophisticated motion-control, slit-scan and streak techniques, earning several Clio Awards along with way. After leaving Abel Films, he worked almost entirely in theatrical features, although he did notable work on Universal's expensive TV series *Buck Rogers in the 25th Century.*

Stewart began his feature film career in 1976-77, beginning with the UFO photography for Steven Spielberg's *Close Encounters of the Third Kind.* On this and subsequent productions, he worked closely with visual effects heavyweights Douglas Trumbull and Richard Yuricich, ASC, who remained his close friends. He became a director of photography in 1979 during the filming of Paramount's *Star Trek — The Motion Picture,* for which he was nominated for an Academy Award. Much of his work was done for Boss Film, headed by Richard Edlund, ASC.

Stewart's subsequent credits as a director of photography for special visual effects include the special edition of *Close Encounters of the Third Kind,* for which new sequences were filmed in 1980; Ridley Scott's *Blade Runner* (1982), which is especially memorable for its scenes of the Los Angeles of the future; and *The Outsiders* (1983) for Zoetrope. Yuricich and Stewart teamed up to film the remarkable multi-image effects for Trumbull's controversial production *Brainstorm* (1983).

Stewart called *2010* "1984's massive challenge," but he came through with outstanding space sequences. An even greater challenge was *The Abyss* (1989), which featured some of the most complex underwater effects ever attempted. His other gredits include *Solar Babies, Coneheads, The Hunt For Red October, Alien*[3] and *Event Horizon.*

Stewart invented circular slit-scan effects. He was also a gifted watercolorist and has been listed in every edition of *Who's Who in Entertainment.*

"Dave always expected a lot from his crew," recalled Pat, his wife of 37 years. "He'd call up the same camerapeople over and over again if they'd measured up. He could be extremely tough on them — storming off the stage and then showing up 20 minutes later to get them laughing. One time he even wore a frilly apron! He would say things like, 'You can't do this? It's impossible? I know you can do it, and imagine how you'll feel when they see that you've done the virtually impossible!' Then he'd tell the crew exactly how to do it."

Dave Stewart is survived by his wife, Pat; two sons, Stephen Jeffrey and Benjamin David; two grandchildren, Taylor and Daniel, and a sister, Jeannie. Services were held October 20 at Glen Haven, San Fernando, California, followed by a wake at his home. ◆

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I certify that the statements made by me above are correct and complete.

— Jim McCullaugh, Publisher

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From the Clubhouse



Fujimoto Joins ASC

The ASC's latest inductee is Tak Fujimoto, a San Diego native with some 25 years of cinematographic experience. After receiving a B.A. in Political Science from the University of California at Berkeley, Fujimoto studied at the London International Film School. In 1970, he began working as an assistant for a commercial production company jointly owned by Cal Bernstein and Haskell Wexler, ASC, a cameraman whom Fujimoto considers to be a valued mentor. Two years later, he earned a position as an assistant on Terrence Malik's *Badlands;* during the course of production, Fujimoto managed to progress to position of camera operator and then director of photography. The following year, he met director Jonathan Demme, with whom he would have a fruitful series of collaborations on such films as *Caged Heat* (1974), *Last Embrace* (1979), *Melvin and Howard* (1980), *Swing Shift* (1984), *Something Wild* (1987), *Married to the Mob* (1988), *Silence of the Lambs* (1991) and *Philadelphia* (1993).

Fujimoto's other credits include *Bootleggers, Cannonball, Remember My Name, Where the Buffalo Roam, Borderline, Heart Like a Wheel, Pretty in Pink, Ferris Bueller's Day Off, Miami Blues, Night and the City, Devil in a Blue Dress* (which earned the National Society of Film Critics' Best Cinematography prize), *Grumpier Old Men, That Thing You Do* and *A Thousand Acres.*

Fujimoto is currently working with director Demme on an adaptation of the Toni Morrison novel *Beloved.*

Hart Becomes ASC Associate

The ASC's newest associate member is Oregon native Richard Hart, a 36-year veteran of the motion picture industry and president of Xenotech/Strong International. He began his career in 1961 as a lighting technician, progressing to chief lighting technician some eight years later. In 1981, while working with cameraman Jordan Cronenweth, ASC on Ridley Scott's futuristic noir film *Blade Runner,* Hart introduced the production to Xenon spotlights, which at the time were fixtures commonly used for night advertising and sporting events. Five years later, he opened up Xenotech Incorporated. In April 1997, the company was acquired by Ballantyne of Omaha, a leading manufacturer of theater projection systems, including the Ballantyne, Strong, Century and Simplex lines; the firm also manufactures Strong Followspots and the Trooper, SuperTrooper and Gladiator series of fixtures.



Photo by Marvin Lopez.

Back row: ***(left to right) Steve Schifrin, CBS, Vice President of Program Production Services; Roger Deakins, ASC; associate member Lou Levinson***
Middle row: ***associate member Garrett Smith; Richard May, Warner Bros. Vice President of Film Preservation; cinematographer Mark Woods; ASC Events Coordinator Patty Armacost.***
Bottom row: ***Kodak representative George Gush; Robert Primes, ASC; Isidore Mankofsky, ASC; Linda Loe Director of Membership and Activities, ATAS; and David Richard, Chair of the Hollywood branch of SMPTE.***

ASC Enjoys Eye-Opening Evening

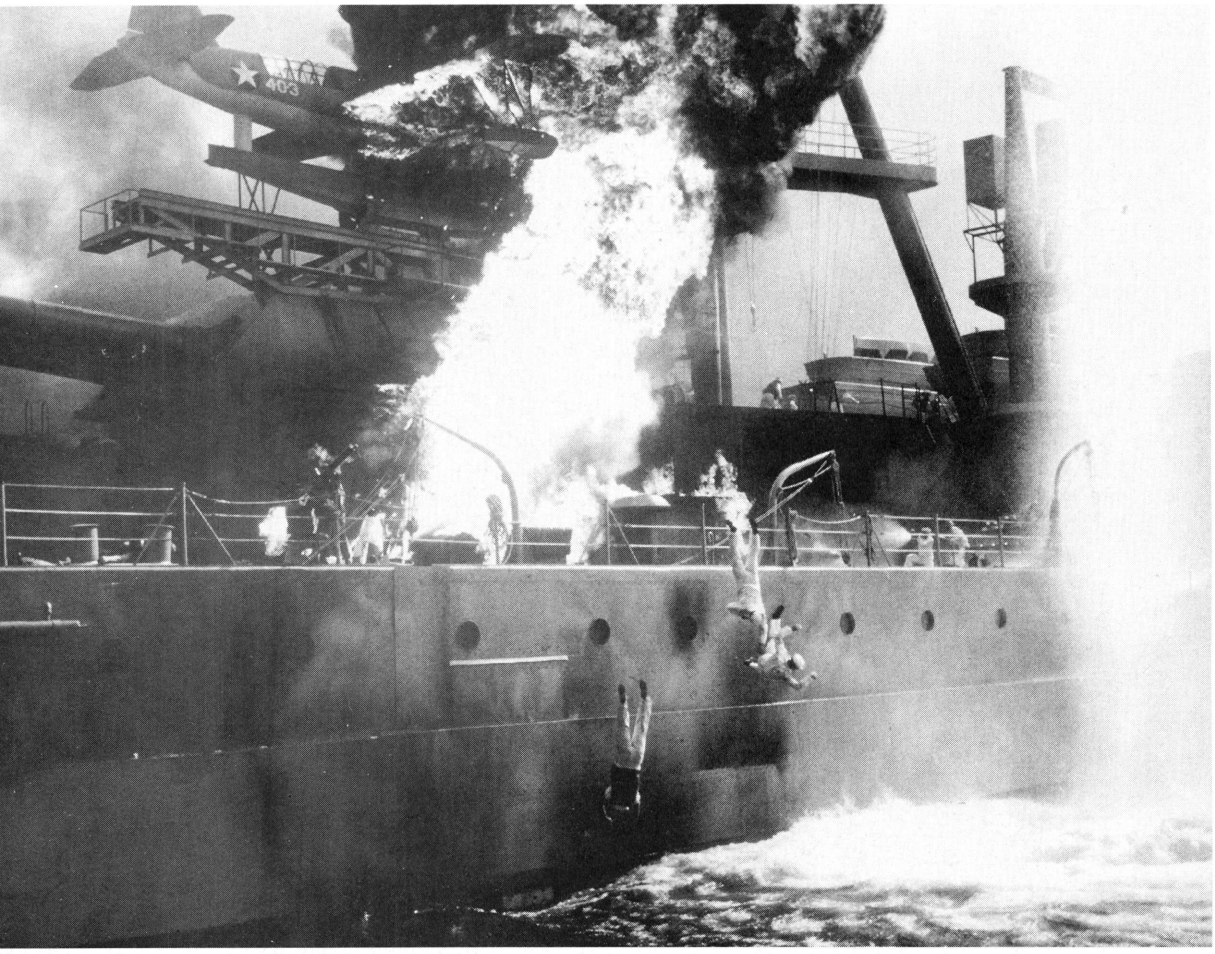
On October 21, a unique dinner and presentation was held at the Television Academy's theater complex, co-hosted by the ASC, SMPTE and the Academy. The night marked the first occasion that the three venerable organizations had jointly planned and attended an event.

The program began as attendees retired to the Academy's spacious theater for presentations and discussion. The night's topic, "From Pictures to Pixels," focused on the processes and perceptions regarding the transfer of motion picture image to video. After introductory comments, event co-organizer Robert Primes, ASC and Kodak representative George Gush unveiled Kodak's new Gray Card Plus, a chart reference system designed to facilitate communication between cinematographers, colorists and color timers. The audience then watched tests utilizing the chart, first via 35mm projection and then as a video image projected by a POWER 4dv projector made by Digital Projection. The demonstration revealed how the Kodak chart allowed both the color timer and colorist to closely match each cinematographer's intent. Participating cinematographers included Primes, Stephen Burum, ASC; Mark Woods, Brian Reynolds and Aaron Schneider. The demonstration was created with the generous assistance of Laser Pacific.

The second presentation was made by ASC Associate member Garrett Smith, who utilized John Toll, ASC's Oscar-winning work in *Braveheart* to create an astonishing program illustrating how 1.85 and 2.35 motion picture images are commonly truncated to fit the 1.33 television frame. Also explored were the possible panning and scanning options open to the networks wishing to air 1.33 programming in the upcoming 16 x 9 HDTV format — provided the networks cling to their need to fully "fill the frame."

The evening concluded with a panel discussion on issues raised by the presentations, with plenty of questions offered by the audience. ◆

Wrap Shot



A large portion of the unprecedented production cost was budgeted for full-scale ship mockups and very large miniatures. Charles Wheeler, ASC served as the show's director of photography, L. B. Abbott, ASC and Art Cruickshank, ASC, were in charge of special photographic effects, and A. D. Flowers was director of the mechanical effects.

This photo shows a small part of a full-size battleship reproduction being bombed and torpedoed, while some stuntmen do their stuff. Some of the live-action and process scenes were staged in Osaka, Japan, including action involving an 80-foot section of a Japanese submarine.

Our term "very large miniatures" isn't the oxymoron one might think. In this case it meant 19 Japanese ships averaging 30 feet in length, 10 American ships averaging 40 feet long, the Battle Ship Row docks at Pearl Harbor, and a lot of surrounding landscape. The American ships were made to a larger scale (three-quarters of an inch to the foot) because they had to be blown up. The explosions were filmed with a special high-speed camera made by Photosonics, Inc., at speeds up to 15 times the normal frame rate. Scenes involving the miniatures were staged over a 40-day period at Sersen Lake (named for long-time special effects director Fred Sersen) at Fox's Malibu Ranch.

The effects work, incidentally, was impeccable.

— George E. Turner

The enormous resources necessary to resink the *R.M.S. Titanic* for director James Cameron's new supermovie are unequalled in movie history, but past films have offered their share of spectacular ship disasters. The *Titanic* itself has been sent to the bottom several times, most notably by British International in *Atlantic* (1929), by a German company in *Titanic* (1943), by Rank Enterprises in *A Night To Remember* (1958) and by 20th Century Fox in *Titanic* (1954).

Of course, these sea disasters are just the tip of the iceberg, if you'll pardon the pun. Another liner suffered the same fate as the *Titanic* in United Artists' *History Is Made at Night* (1937); a Japanese aircraft carrier was destroyed in Universal's *We've Never Been Licked* (1943); all kinds of military ships were wiped out in Warner Bros.' *Action in the North Atlantic* (1943); and an all-star cast endured the salty splash of a tidal wave in *The Poseidon Adventure* (1972).

Our Wrap Shot is but one moment from what was probably the biggest sea disaster film from the past, *Tora! Tora! Tora!*. Released in 1970, the epic picture cost 20th Century Fox what was then an unprecedented bundle: $25 million. The finished product, a three-hour roadshow revealing both the American and Japanese viewpoints of the Pearl Harbor attack, required a reasonable facsimile of the destruction of the American fleet.

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